1	S	J	2	4					

SJC INSTITUTE OF TECHNOLOGY
(An Autonomous Institute under VTU, Belagavi)

SECOND SEMESTER B.E DEGREE SUMMER SEMESTER END EXAMINATIONS

SEPTEMBER 2025

Course:	**MATHEMATICS-II FOR CV STREAM**		
Course Code:	**BMATC201**	**Branches: Civil**	
Max Marks:	**100**	**Duration:**	**03 Hours**

Note:
1. Answer any FIVE full questions, choosing one full Question from each Module.
2. Any missing Data can be suitably assumed.
3. Formula Handbook Permitted.

Q. No.		**Module - 1**	**Marks**	**CO**	**RBTL**
Q1	**a**	Evaluate $\int_{-1}^{1}\int_{0}^{z}\int_{x-z}^{x+z}(x+y+z)dxdydz$.	**6**	**1**	**L2**
	b	By changing the order of integration, evaluate $\int_0^\infty \int_x^\infty \frac{e^{-y}}{y}\, dy\, dx$.	**8**	**1**	**L2**
	c	Prove that $\Gamma\left(\frac{1}{2}\right) = \sqrt{\pi}$.	**6**	**1**	**L3**
		OR			
Q2	**a**	Evaluate $\int_{-c}^{c}\int_{-b}^{b}\int_{-a}^{a}(x^2+y^2+z^2)dxdydz$.	**6**	**1**	**L2**
	b	By changing the order of integration, evaluate $\int_0^1 \int_x^{\sqrt{x}} xy\, dy\, dx$.	**8**	**1**	**L2**
	c	Derive the relation between Beta and Gamma function of $\beta(m,n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$.	**6**	**1**	**L3**
		Module – 2			
Q3	**a**	Find directional derivative of $\varphi = x^2yz + 4xz^2$ at the point (1, -2, 1) in the direction of the vector $2\hat{i}$-$\hat{j}$-$2\hat{k}$.	**6**	**2**	**L2**
	b	Find the angle between the surfaces $x^2 + y^2 - z^2 = 4$ *and* $z = x^2 + y^2 - 13$ *at* (2,1,2).	**8**	**2**	**L3**
	c	Using Green's theorem, evaluate $\int (xy + y^2)\, dx + x^2 dy$, where C is the closed curve of the region bounded by $y = x$ and $y = x^2$.	**6**	**2**	**L4**
		OR			
Q4	**a**	Define an irrotational vector. Find the constants a, b and c such that $\vec{A}$ = $(axy - z^3)$ i+ $(bx^2 + z)$ j+(bxz^2+cy) k is irrotational.	**6**	**2**	**L2**
	b	If $\vec{F}$ = $\nabla(xy^3z^2)$ find *div* $\vec{F}$ and *curl* $\vec{F}$ at the point (1, −1, 1).	**8**	**2**	**L3**
	c	Use Stoke's theorem, evaluate $\vec{F} = (x^2+y^2)\, i - 2xy\, j$ taken around rectangle bounded by $x = 0, x = a, y = 0, y = b$.	**6**	**2**	**L4**
		Module – 3			
Q5	**a**	Form the partial differential equation by eliminating the arbitrary constants from $(x-a)^2 + (y-b)^2 + z^2 = 4$	**6**	**2**	**L2**
	b	Solve $\frac{\partial^2 z}{\partial x^2} = xy$, subject to the conditions $\frac{\partial z}{\partial x} = \log(1+y)$, when x=1 and z=0, when x=0.	**8**	**2**	**L2**

	c	With usual notations derive a one-dimensional heat equation	**6**	**2**	**L3**
		OR			
Q6	**a**	Form the partial differential equation by eliminating the arbitrary function from the relation $lx + my + nz = f(x^2 + y^2 + z^2)$	**6**	**2**	**L2**
	b	Solve $x^2(y^2 - z^2)\ p + y^2(z^2 - x^2)\ q = z^2(x^2 - y^2)$ using Lagrange's multipliers.	**8**	**2**	**L2**
	c	With usual notations derive a one-dimensional wave equation.	**6**	**5**	**L3**
		Module – 4			
Q7	**a**	By Newton's-Raphson method find the root of $x\ sin\ x + cos\ x = 0$ which is near to $x = \pi$.	**6**	**3**	**L2**
	b	Evaluate $\int_0^{\frac{\pi}{2}} \sqrt{\sin\theta}\ d\theta$ by taking 7 ordinates using Simpon's $\left(\frac{1}{3}\right)^{rd}$ *rule*.	**8**	**3**	**L2**
	c	Given, $\sin 45^0 = 0.7071$, $\sin 50^0 = 0.7660$, $\sin 55^0 = 0.8192$, $\sin 60^0 = 0.8660$, find $\sin 48^0$ using Newton's forward interpolation formula.	**6**	**3**	**L3**
		OR			
Q8	**a**	Find a real root of $x^3 - 9x + 1 = 0\ in\ (2, 3)$ by the Regula-Falsi method in four iterations.	**6**	**3**	**L2**
	b	Using Lagrange's interpolation formula, which passes through the points $(-1, 0)$, $(1, 2)$, $(2, 9)$ and $(3, 8)$ and hence estimate the value of y when $x = 2.2$.	**8**	**3**	**L2**
	c	Determine f(x) at x=9 for the data, given below by using Newton's divided difference formula: x: 2, 4, 5, 6, 8, 10 $f(x)$: 10, 96, 196, 350, 868, 1746	**6**	**3**	**L3**
		Module – 5			
Q9	**a**	Use Taylor's series method to find y (0.2) from $\frac{dy}{dx} = x^2y - 1$, with y (0) = 1.	**6**	**4**	**L2**
	b	Given $\frac{dy}{dx} = \frac{y-x}{y+x}$ with the initial condition y=1 when x=0. Find approximately y for x=0.1 by Modified Euler' method. Carry out three modifications.	**8**	**4**	**L3**
	c	Write a modern mathematical tool program to solve $y' + 4y = x^2$ with initial conditions y (0) = 1 using Taylor's series method at x=0.1, 0.2	**6**	**5**	**L5**
		OR			
Q10	**a**	Using modified Euler's formula, compute y(1.1) corrects to three decimal places given that $\frac{dy}{dx} + \frac{y}{x} = \frac{1}{x^2}$ and y=1 at x=1.	**6**	**4**	**L2**
	b	Using Runge - Kutta method of order 4, find y at x=0.1, given that $\frac{dy}{dx} = 3e^x + 2y$, y (0) = 1	**8**	**4**	**L3**
	c	Write a modern mathematical tool program to solve $\frac{dy}{dx} = 2x + y,\ y(1) = 2$ by the Runge-Kutta 4th order method.	**6**	**5**	**L5**

1	S	J	2	4					

SJC INSTITUTE OF TECHNOLOGY
(An Autonomous Institute under VTU, Belagavi)

FIRST/SECOND SEMESTER B.E DEGREE SUMMER SEMESTER END EXAMINATIONS

SEPTEMBER 2025

Course:	**MATHEMATICS II FOR EC STREAM**		
Course Code:	**BMATE201**	**Branches: ECE**	
Max Marks:	**100**	**Duration:**	**03 Hours**

Note:
1. Answer any FIVE full questions, choosing one full Question from each Module.
2. Any missing Data can be suitably assumed.
3. Formula Handbook Permitted.

Q. No.		Module - 1	Marks	CO	RBTL
Q1	a	Find the angle between the surfaces $x^2+y^2-z^2=4$ and $x^2+y^2-13=z$ at the point $(2,1,2)$.	6	1	L2
	b	If $\vec{F}=grad(x^3+y^3+z^3-3xyz)$, find $div\vec{F}$ and $Curl\vec{F}$.	8	1	L2
	c	Evaluate using Stoke's theorem given $\vec{F}=(x^2+y^2)\hat{i}-2xy\hat{j}$ taken around by the lines $x=\pm a, y=0, y=b$.	6	1	L3
		OR			
Q2	a	Find the values of a & b, such that the surfaces $ax^2-byz=(a+2)x$ and $4x^2y+z^3=4$ are orthogonal at the point $(1,-1,2)$.	6	1	L2
	b	Find the constants $a,b\,\&\,c$, such that $\vec{F}=(x+y+az)\hat{i}+(bx+2y-z)\hat{j}+(x+cy+2z)\hat{k}$ is an Irrotational. Also find the scalar potential ϕ, for which $\vec{F}=\nabla\phi$.	8	1	L2
	c	Evaluate using Green's theorem in the plane for $\int(x^2+y^2)dx+3x^2ydy$, where C is the circle $x^2+y^2=4$ traced by the positive sense.	6	1	L3
		Module – 2			
Q3	a	Verify the Rank-nullity theorem for the linear transformation T: $V_3(R) \rightarrow V_2(R)$ defined by $T(x, y, z) = (y - x, y - z)$.	6	2	L2
	b	Find the Basis and dimension of the subspace spanned by the vectors $\{(2,4,2), (1,-1,0), (1,2,1), (0,3,1)\}$ in $V_3(R)$.	8	2	L2
	c	Show that the functions $f(x)=3x-2$ and $g(x)=x$ are orthogonal in P_n with inner product $\langle f, g\rangle = \int_0^1 f(x)g(x)dx$.	6	2	L4
		OR			
Q4	a	Find the matrix of the linear transformation T: $V_2(R) \rightarrow V_3(R)$ such that T (-1, 1) = (-1, 0, 2) and T (2, 1) = (1, 2, 1).	6	2	L2
	b	Find the Basis and dimension of the subspace spanned by the vectors $\{(1,-2,3), (1,-3,4), (-1,1,-2)\}$ in $V_3(R)$.	8	2	L2
	c	Show that the functions $f(t)=4t+3$ and $g(t)=t^2$ the inner product $\langle f, g\rangle = \int_0^1 f(t)g(t)dt\ f(t)g(t)dt$. Find $\langle f, g\rangle$ and norm of g.	6	2	L4

		Module – 3			
Q5	**a**	Find the Laplace transform of F(t) = cos tcos 2tcos 3t.	**6**	**3**	**L2**
	b	Find Laplace transform of square wave Function of period $2a$ defined by $f(t) = \begin{cases} k & 0 < t < \frac{a}{2} \\ -k & \frac{a}{2} < t < a \end{cases}$	**8**	**3**	**L2**
	c	Analyze the given differential equation $\frac{d^2y}{dt^2} + K^2y = 0$, with initial conditions $y(0) = 2, y'(0) = 0$ by transforming it using Laplace transform.	**6**	**3**	**L4**
		OR			
Q6	**a**	Find the Laplace Transform of $\frac{\cos at - \cos bt}{t}$	**6**	**3**	**L2**
	b	Express f(t) = $\begin{cases} \text{Sint} & 0 < t < \pi \\ \text{Sin2t} & \pi < t < 2\pi \\ \text{Sin3t} & t > 2\pi \end{cases}$ in terms of unit step function & hence find L[f(t)].	**8**	**3**	**L2**
	c	Analyze the given Laplace transform $\frac{2s+1}{s^2+3s+1}$ by identifying appropriate algebraic manipulations and transformations needed to determine its inverse Laplace form in the time domain.	**6**	**3**	**L4**
		Module – 4			
Q7	**a**	Find an approximate Real root of the equation $\cos x = 3x - 1$using False position method and carry out 4 iterations.	**6**	**4**	**L2**
	b	Given f(40) = 184, f(50) = 204, f(60) = 226, f(70) = 250, f(80) = 276, f(90) = 304, find f(38) and f(85) using suitable interpolation formulae.	**8**	**4**	**L2**
	c	Evaluate $\int_0^6 \frac{dx}{1+x^2}$ using Trapezoidal rule by taking 6 equal parts.	**6**	**4**	**L3**
		OR			
Q8	**a**	Find the real root of the equation xsinx + cosx = 0 near x = π using Newton-Raphson method.	**6**	**4**	**L2**
	b	For the following data,find f(6) using Lagrange's Interpolation formula. x: 5 7 11 13 17 f(x): 150 392 1452 2366 5202	**8**	**4**	**L2**
	c	Evaluate $\int_0^3 \frac{dx}{4x+5}$ by Simpson's $(1/3)^{rd}$ rule, dividing the interval into 6 equal parts.	**6**	**4**	**L3**
		Module – 5			
Q9	**a**	By using modified Euler's method, Examine y(0.2) taking h=0.1 $\frac{dy}{dx} = \frac{y-x}{y+x}$, with y(0)=1.	**6**	**4**	**L2**
	b	Given $\frac{dy}{dx} = xy + y^2$, y (0) = 1, y (0.1) = 1.1169, y (0.2) = 1.2773, y (0.3) = 1.5049 compute y(0.4) using Milne's method.	**8**	**4**	**L3**
	c	Using modern mathematical tools, write the code to find the solution of $\frac{dy}{dx} = 1 + \frac{y}{x}$ at (2) taking h = 0.2. Given that y(1) = 2 by Runge-Kutta 4th order method.	**6**	**5**	**L5**
		OR			
Q10	**a**	Solve $\frac{dy}{dx} = e^x - y^2$, y(0) = 1 using Taylor's series method to evaluate y (0.2).	**6**	**4**	**L2**
	b	Using the Runge- Kutta method of order four, find y at x=0.1 given that $\frac{dy}{dx} = x + y$, y =1 when x = 0.	**8**	**4**	**L3**
	c	Using modern mathematical tools, write the code to find the solution $y' = -ky$ with $y(0) = 100$ using modified Euler's method at $x = 100$, by taking $h = 25$.	**6**	**5**	**L5**

1	S	J	2	4					

SJC INSTITUTE OF TECHNOLOGY
(An Autonomous Institute under VTU, Belagavi)
SECOND SEMESTER B.E DEGREE SUMMER SEMESTER END EXAMINATIONS
SEPTEMBER 2025

Course:	**MATHEMATICS - II FOR ME STREAM**		
Course Code:	**BMATM201**	**Branches: ME, AE & ASE**	
Max Marks:	**100**	**Duration:**	**03 Hours**

Note:
1. Answer any FIVE full questions, choosing one full Question from each Module.
2. Any missing Data can be suitably assumed.
3. Formula Handbook Permitted

Q. No.		Module - 1	Marks	CO	RBTL
Q1	a	Obtain the Maclaurin's series of $\sqrt{1+\sin 2x}$.	6	1	L2
	b	If $u = f(x-y, y-z, z-x)$, then prove that $\frac{\partial u}{\partial x}+\frac{\partial u}{\partial y}+\frac{\partial u}{\partial z}=0$.	8	1	L3
	c	Examine the extreme values of $f(x,y) = x^3+y^3-3x-12y+20$.	6	1	L3
		OR			
Q2	a	If $u = e^{ax+by}f(ax-by)$ then find $x\,u_x + y\,u_y$.	6	1	L2
	b	If $u = f\left(\frac{x}{y}, \frac{y}{z}, \frac{z}{x}\right)$, then prove that $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}+z\frac{\partial u}{\partial z}=0$	8	1	L3
	c	If $u = \frac{yz}{x}$, $v = \frac{zx}{y}$, $w = \frac{xy}{z}$ then prove that $\frac{\partial(u,v,w)}{\partial(x,y,z)} = 4$.	6	1	L3
		Module – 2			
Q3	a	Find the angle between the surfaces $x^2+y^2-z^2=4$ and $z = x^2+y^2-13$ at $(2,1,2)$.	6	2	L2
	b	Find the constants a, b and c such that $\vec{A} = (axy-z^3)i+(bx^2+z)j+(bxz^2+cy)k$ is irrotational.	8	2	L3
	c	Apply Stoke's theorem to evaluate $\int \vec{F}\cdot d\vec{r}$ where $\vec{F} = y^2\hat{\imath}+x^2\hat{\jmath}-(x+z)\hat{k}$ and C is the boundary of the triangle with the vertices (0, 0, 0), (1, 0, 0), (1, 1, 0).	6	2	L4
		OR			
Q4	a	Show that $\vec{F} = \frac{x\,\hat{\imath}+y\hat{\jmath}}{x^2+y^2}$ is a solenoidal.	6	2	L2
	b	If $\vec{F} = \nabla(xy^3z^2)$ then find div $\vec{F}$ and curl $\vec{F}$ at (1, -1, 1).	8	2	L3
	c	Using Green's theorem, evaluate $\int(xy+y^2)dx+x^2dy$, where C is the closed curve of the region bounded by $y = x$ and $y = x^2$.	6	2	L4
		Module – 3			
Q5	a	Form the partial differential equation by eliminating the arbitrary constants from $(x-a)^2+(y-b)^2+z^2=4$.	6	3	L2
	b	Solve $\frac{\partial^2 z}{\partial y^2} = z$, given that when y = 0, $z = e^x$ and $\frac{\partial z}{\partial y} = e^{-x}$.	8	3	L3
	c	With usual notations derive a one - dimensional heat equation.	6	3	L3

OR

Q6	**a**	Form the partial differential equation from the relation $z = f(x + at) + g(x - at)$.	**6**	**3**	**L2**
	b	Solve $\frac{\partial^2 z}{\partial x^2} = xy$, subject to the conditions $\frac{\partial z}{\partial x} = \log(1 + y)$, when x = 1 and z = 0, when x = 0.	**8**	**3**	**L3**
	c	With usual notations derive a one - dimensional wave equation.	**6**	**3**	**L3**

Module – 4

Q7	**a**	Find an approximate real root of the equation $cosx = 3x - 1$ using False position method and carry out 3 iterations.	**6**	**3**	**L2**
	b	Using Newton's forward interpolation find y at x=5 from the data x: 4, 6, 8, 10 y: 1, 3, 8, 16	**8**	**3**	**L3**
	c	Evaluate $\int_4^{5.2} \log x \, dx$ using Simpson's $(3/8)^{th}$ rule by taking 7 ordinates.	**6**	**3**	**L4**

OR

Q8	**a**	Find the real root of the equation $x\sin x + \cos x = 0$ near $x = \pi$ using Newton-Raphson method.	**6**	**3**	**L2**
	b	The population of a town is given by the following table Year: 1951, 1961, 1971, 1981, 1991 Population: 19.6, 39.65, 58.81, 72.21, 94.61 Using Newton's backward interpolation formula, calculate the population in the year 1985.	**8**	**3**	**L3**
	c	Evaluate $\int_0^{0.3} (1 - 8x^3)^{\frac{1}{2}} dx$ by using Simpson's $(1/3)^{rd}$ rule, by taking 3 equal intervals.	**6**	**3**	**L4**

Module – 5

Q9	**a**	Using Taylor's series method to find y(0.2) from $\frac{dy}{dx} = x^2y - 1$, with y(0)=1.	**6**	**4**	**L2**
	b	Apply Milne's Predictor - Corrector method, find y(0.8), from $\frac{dy}{dx} = x^3 + y$, given that $y(0) = 2$, $y(0.2) = 2.073$, $y(0.4) = 2.452$, $y(0.6) = 3.023$.	**8**	**4**	**L3**
	c	Using modern mathematical tool write a program/code to solve $\frac{dy}{dx} = 2x + y$, $y(1) = 2$ by the Runge - Kutta 4th order method.	**6**	**5**	**L5**

OR

Q10	**a**	Given $\frac{dy}{dx} = \frac{y-x}{y+x}$ with the initial condition y=1 when x=0. Find approximately y for x = 0.1 by Modified Euler's method. Carry out three modifications.	**6**	**4**	**L2**
	b	Using Runge - Kutta method of order 4, find y at x = 0.1, given that $\frac{dy}{dx} = 3e^x + 2y$, y(0)=1.	**8**	**4**	**L3**
	c	Using modern mathematical tool write a program/code to solve $y' + 4y = x^2$ with initial conditions y(0)=1 using Taylor's series method at x = 0.1 , 0.2 .	**6**	**5**	**L5**

1	S	J	2	4					

SJC INSTITUTE OF TECHNOLOGY
(An Autonomous Institute under VTU, Belagavi)
SECOND SEMESTER B.E DEGREE SUMMER SEMESTER END EXAMINATIONS
SEPTEMBER 2025

Course:	**MATHEMATICS - II FOR CS STREAM**		
Course Code:	**BMATS201**	**Branches: CSE, ISE, CSD, AIML, AI&DS**	
Max Marks:	**100**	**Duration:**	**03 Hours**

Note:

1. Answer any FIVE full questions, choosing one full Question from each Module.
2. Any missing Data can be suitably assumed.
3. Formula Handbook Permitted

Q. No.		Module - 1	Marks	CO	RBTL
Q1	a	Find the directional derivative of $\varphi = 4xz^3 - 3x^2y^2z$ at $P(2,-1,2)$ along $2\hat{\imath} - 3\hat{\jmath} + 6\hat{k}$	6	1	L2
	b	If $\vec{F} = grad(x^3 + y^3 + z^3 - 3xyz)$, find $div\vec{F}$ and $Curl\vec{F}$.	8	1	L2
	c	Show that spherical coordinate system is orthogonal.	6	1	L3
		OR			
Q2	a	Find the constant 'a' so that $\vec{F} = y(ax^2 + z)i + x(y^2 - z^2)j + 2xy(z - xy)k$ *is Solinoidal*	6	1	L2
	b	Find the angle between the surfaces $x^2 + y^2 + z^2 = 9$ and $x^2 + y^2 - 3 = z$ at the point $(2,-1,2)$	8	1	L2
	c	Show that cylindrical coordinate system is orthogonal.	6	1	L3
		Module – 2			
Q3	a	Prove the subspace W=$\{(x,y,z) \backslash x - 3y + 4z = 0\}$ of vector space R^3 is a subspace of R^3.	6	2	L2
	b	Verify the Rank-nullity theorem for the linear transformation T: $V_3(R) \rightarrow V_3(R)$ defined by $T(x, y, z)$ = (x+2y-z, y +z, x+y − 2z).	8	2	L3
	c	Show that the functions f(t) = 4t+3 and g(t) = t^2 the inner product $\langle f, g\rangle = \int_0^1 f(t)g(t)dt$. Find $\langle f, g\rangle$ and norm of g.	6	2	L3
		OR			
Q4	a	Find the Basis and dimension of the subspace spanned by the vectors $\{(2,4,2),\ (1,-1,0),(1,2,1),\ (0,3,1)\}$ in $V_3(R)$.	6	2	L2
	b	Find the kernel and range of the linear operator and also verify rank-nullity theorem, T (x, y, z) = (x + y, z) of $R^3 \rightarrow R^2$	8	2	L3
	c	Analyze the matrix of the linear transformation T: $V_2(R) \rightarrow V_3(R)$ such that T (-1, 1) = (-1, 0, 2) and T (2, 1) = (1, 2, 1).	6	2	L4
		Module – 3			
Q5	a	Find the remainder when (349×74 ×36) is divided by 3.	6	2	L2
	b	Solve the system of linear congruence x≡3(mod5),y≡2(mod 6), z≡4(mod 7) using Remainder Theorem.	8	2	L3

	c	Justify for what the least positive values of x such that i) 78 + x=3(mod 5) ii) 89 = (x+3)(mod 4)	**6**	**2**	**L4**
		OR			
Q6	**a**	i) Find the remainder when 2^{23} is divided by 47. ii) Find the last digit in 7^{118}.	**6**	**2**	**L2**
	b	Using Fermat's Little Theorem, show that $8^{30}-1$ is divisible by 31.	**8**	**2**	**L3**
	c	Encrypt the message STOP using RSA with key (2537, 13) using the prime numbers 43 and 59.	**6**	**2**	**L4**
		Module – 4			
Q7	**a**	Using Newton-Raphson method, find a real root of $xSinx + Cosx = 0$ near to $x = \pi$.	**6**	**3**	**L2**
	b	For the following data find f(9) using Newton's divided difference formula x: 5 7 11 13 17 f(x): 150 392 1452 2366 5202.	**8**	**3**	**L3**
	c	Evaluate $\int_0^6 \frac{x}{1+x^2}dx$ by taking six equal divisions using Trapezoidal rule.	**6**	**3**	**L4**
		OR			
Q8	**a**	Given, $\sin 45^0$= 0.7071, $\sin 50^0$ = 0.7660, $\sin 55^0$ = 0.8192, $\sin 60^0$ = 0.8660, find $\sin 48^0$ using Newton's forward interpolation formula.	**6**	**3**	**L2**
	b	Use Lagrange's interpolation formula to estimate y at x = 2. for the data x: 0, 1, 3, 4 y: -12, 0, 6, 12	**8**	**3**	**L3**
	c	Use Simpson's $\frac{3}{8}^{th}$ rule to evaluate $\int_4^{5.2} log_e\, x\, dx$ by taking 7 ordinates.	**6**	**3**	**L4**
		Module – 5			
Q9	**a**	Employ the Taylor's series method to find y at $x = 0.1$ correct to four decimal places , given $\frac{dy}{dx} = e^x - y^2; y(0) = 1$.	**6**	**4**	**L2**
	b	Apply Modified Euler's method find $y(3.4)$, given $\frac{dy}{dx} = \frac{-y}{1+x}; y(3) = 2$, Perform two iterations at each step , taking $h = 0.2$.	**7**	**4**	**L3**
	c	Write a program to find the solution of ODE of first order $\frac{dy}{dx} = 1 + \frac{y}{x}; y(0) = 1, h = 0.1$ by Runge-Kutta method of fourth order using any mathematical tool.	**7**	**5**	**L5**
		OR			
Q10	**a**	Given $\frac{dy}{dx} = x - y^2; y(0) = 1, y(0.1) = 0.9117, y(0.2) = 0.8494, \quad y(0.3) = 0.8061.$ Compute y at $x = 0.4$ by using Milne's predictor-corrector formula.	**6**	**4**	**L2**
	b	Apply Runge-Kutta method of fourth order to find $y(1.1)$ from $\frac{dy}{dx} = 2x - y;\ y(1) = 3$, taking $h = 0.1$.	**7**	**4**	**L3**
	c	Write a program to find the solution of ODE of first order $\frac{dy}{dx} = -2y + x^3e^{-2x}$; by using Modified Euler's method.	**7**	**5**	**L5**

1	S	J	2	4					

Version: A

SJC INSTITUTE OF TECHNOLOGY

(An Autonomous Institute under VTU, Belagavi)

FIRST/SECOND SEMESTER B.E DEGREE SUMMER SEMESTER END EXAMINATIONS

SEPTEMBER 2025

Course:	**PROFESSIONAL WRITING SKILLS IN ENGLISH**		
Course Code:	**BPWS206**	**Stream: Common to all the branches**	
Max Marks:	**50**	**Duration:**	**1 Hour**

Note: 1. Answer all the questions.

Q.NO.	Questions	Marks	CO	RBTL
1.	Identify the sentence with the correct subject-verb agreement: a) The pack of wolves is hunting in the forest. b) The pack of wolves are hunting in the forest. c) The pack of wolves was hunting in the forest. d) The pack of wolves were hunting in the forest.	1	1	L1
2.	Choose the sentence with the correct use of pronoun: a) I and Dhoni went to college b) Dhoni and I went to college c) Dhoni and me went to college d) None of these	1	1	L1
3.	Choose the sentence with the correct use of phrasal verb. a) She looks out for her friends b) She looks for out her friends c) She looks her friends out for d) She looks her friends out	1	1	L1
4.	Choose the sentence with the correct use of phrasal verb. a) He put up the picture on the wall. b) He put the picture up on the wall. c) He put the wall with the picture. d) He put the wall up the picture.	1	1	L1
5.	Choose the sentence with the correct use of phrasal verb. a) He looks out for his younger sister. b) He looks out his younger sister after. c) He looks his younger sister. d) He looks his younger sister out.	1	1	L1
6.	Choose the sentence with the correct use of verb form. a) They has completed the project. b) They have completed the project. c) They have complete the project. d)) They have completing the project.	1	1	L1
7.	Choose the sentence with the correct use of verb form. a) They have swimming in the pool b) They have swam in the pool c) They have swum in the pool d) They have swimming in the pool.	1	1	L1
8.	Identify the sentence with the correct use of auxiliary verb. a) She been working hard all day. b) She is working hard all day. c) She do working hard all day. d) She does working hard all day.	1	1	L2
9.	Sudha Murty was born to a Kannada-speaking family on 19August _____. a) 1950 b)1960 c) 1970 d) 1980	1	1	L1
10.	Sudha Murthy started Infosys Foundation in the year . a)1995 b)1990 c)1996 d)1992	1	1	L1
11.	An Essay can be divided into ____ distinct parts. a) 2 b) 4 c) 5 d) 3	1	1	L1
12.	Which is the correct collocation? a) Do a good job b) Make a good job c) Have a good job d) Take a good job	1	2	L1
13.	Our taxi's here._____ go!" Which would almost always fill this gap? a)it's b)Let's c)We'd d)we'll	1	2	L2
14.	Professional writing demands use of language. a) Figurative b) poetic c) factual d) dramatic	1	2	L2

15.	Which of these do not deal with precise information in professional writing? a) Engineer b) Scientist c) Technician d) Fiction writer	**1**	**2**	**L1**
16.	Which of these parameters are not required to define style in professional writing? a) Moral truth b) Compassion c) Gender d) Information	**1**	**2**	**L1**
17.	Which adjective best collocates with "advice"? a)Strong b)Heavy c)Hard d)None of these	**1**	**2**	**L2**
18.	Select the correctly punctuated sentence. a) John's father is a bank manager. b) John father is a bank manager. c) John's father, is a bank manager. d) John father, is a bank manager	**1**	**2**	**L1**
19.	When is an exclamation mark used? a) To introduce a list b) At the end of a sentence to express strong emotion or surprise c) To separate items in a series d) To indicate possession	**1**	**2**	**L1**
20.	The word precise is derived from . a) Greek b) French c) English d) None	**1**	**2**	**L1**
21.	What is the primary purpose of scientific writing? a) To entertain readers b) To present research findings clearly and accurately c) To promote personal opinions d) To summarize existing literature	**1**	**2**	**L1**
22.	Which of these must be avoided in technical writing? a) facts b) grammar c) punctuation d) personal feelings	**1**	**2**	**L1**
23.	A technical report establishes a _____. a) illogical conclusion b) logical conclusion c) personal prejudice d) misplaced learning	**1**	**2**	**L1**
24.	Which of these is usually written in a form of a memorandum? a)Informal reports b)Formal reports c)Professional reports d)Business reports	**1**	**2**	**L1**
25.	Into which of these types are formal reports not classified? a)Informational b)Interpretative c)Oral d) Routine	**1**	**2**	**L1**
26.	Report provides rational findings. a)Informative b)Interpretative c)Routine d) Progress	**1**	**2**	**L2**
27.	Creating and publishing video content on a blog is called? a)Vlog b)News c)Media blog d)All of these	**1**	**2**	**L2**
28.	To write a survey type proposal, most considerable appropriate pre-writing technique, consolidating: a)flowcharting b)organizational charts c)storyboarding d)All of above	**1**	**2**	**L2**
29.	Find out which part of sentence has an error: He could have taken interest in Mathematics if his father had been teacher. a)if his parents b)He could have taken2 c)had been teacher d)interest in Mathematics	**1**	**2**	**L2**
30.	In the Cloze test, we are given a passage in which a few blanks are given. a) Passage b) Summary c) quiz d) report	**1**	**2**	**L1**
31.	How should a business letter look like? a) it has to be professional and effective by using the template b) it should be written using east words so that an illiterate can also understand c) it has to be written similarly to an informal letter d) it should be written brief and short	**1**	**3**	**L1**
32.	Email stands for, a)electronic mail b)electric mail c)emergency mail d)essential mail	**1**	**3**	**L1**
33.	A summary of the applicant at the start of the CV acts as a? a)letter of recommendation b)statement of objectives c)synopsis d) preface	**1**	**3**	**L1**

34.	A report sent to somebody within the organization will be in a format. a)Manuscript b)Memos c) Letter d) Pre-printed	**1**	**3**	**L1**
35.	What does "CC" stand for in email terminology? a)Carbon Copy b) Computer Code c)Copy Count d)Correct Copy	**1**	**3**	**L1**
36.	What should you do after finishing your resume? a) Proof read it for errors b) Have other people proofread it c) Keep it in good conditio d) All	**1**	**3**	**L1**
37.	Which of these occur because of difference in language? a)Physical barriers b)Linguistic barriers c)Cultural barriers d)Speech decoding	**1**	**3**	**L1**
38.	Which of these is not a barrier to listening? a)Physical barrier b)Cultural barrier c)Linguistic barrier d)Written barrier	**1**	**3**	**L1**
39.	What should you include in your contact information? a)Your permanent address b)Your email address c) Your phone number d)All of these	**1**	**3**	**L1**
40.	Which of the following sections is NOT optional on a resume? a)Hobbies and Interests b)Education c)Languages d)Professional Memberships	**1**	**3**	**L1**
41.	Which kind of interview includes a process in which the employability of the job applicant is evaluated a)stress interview b)screening interview c)group interview d)behavior interview	**1**	**3**	**L1**
42.	What is the primary goal of communication in the workplace? a) To ensure that employees understand their tasks and responsibilities. b) To entertain coworkers. c) To create misunderstandings. d) To gossip.	**1**	**3**	**L1**
43.	What is the most important factor for effective team work? a)individual success b)clear communication c)personal conflicts d)competition within the team	**1**	**3**	**L1**
44.	Which of these has maximum reach in professional writing? a) writing b) listening c) speaking d) talking	**1**	**3**	**L1**
45.	Which of these can negatively impact teamwork? a)trust and collaboration b)clear roles and responsibilities c)poor communication and lack of trust d)mutual respect among members	**1**	**3**	**L1**
46.	Emotional intelligence in leadership includes all except: a)self-awareness b)empathy c)manipulation d)relationship management	**1**	**3**	**L2**
47.	Which of the fallowing is a key trait of an effective leader a)passive behavior b)clear communication c)indecisiveness d)avoiding responsibilities	**1**	**3**	**L1**
48.	What are the successful strategies for interviews? a)personal report b)good eye contact c)clear ideal of the key point d)all of these	**1**	**3**	**L1**
49.	Which Of The Following Should Be Adopted At An Interview a)using hand gestures b)crossing hands together c)fiercely nodding head continuously d)expressing the disagreement in too much negative way	**1**	**3**	**L1**
50.	Which of the following statement about facing interview is false? a)greet people with smile and firm handshake b)make good eye contact c)express your weaknesses more positively d)don't make an attempt to read the body language of the interviewers	**1**	**3**	**L1**

1	S	J	2	4					

SJC INSTITUTE OF TECHNOLOGY
(An Autonomous Institute under VTU, Belagavi)
FIRST SEMESTER B.E DEGREE SUMMER SEMESTER END EXAMINATIONS
SEPTEMBER 2025

Course:	**MATHEMATICS I FOR CV STREAM**		
Course Code:	**BMATC101**	**Branches: CIVIL**	
Max Marks:	**100**	**Duration:**	**03 Hours**

Note:

1. Answer any FIVE full questions, choosing one full Question from each Module.
2. Any missing Data can be suitably assumed.
3. Formula Handbook Permitted.

Q. No.		**Module – 1**	**Marks**	**CO**	**RBTL**
Q1	**a**	Find the angle between the radius vector and tangent vector of the curve r = a(1+cos θ) at $\theta = \frac{\pi}{3}$.	**6**	**1**	**L2**
	b	With usual notation prove that , $\tan\phi = r\frac{d\theta}{dr}$.	**8**	**1**	**L3**
	c	Find the radius of curvature of the curve $y = alog\left(sec\left(\frac{x}{a}\right)\right)$ at any point (x, y).	**6**	**1**	**L3**
		OR			
Q2	**a**	Find the angle between the two polar curves $r^2 Sin2\theta = 4$ and $r^2 = 16Sin2\theta$.	**6**	**1**	**L2**
	b	With usual notation prove that $\frac{1}{p^2} = \frac{1}{r^2} + \frac{1}{r^4}\left(\frac{dr}{d\theta}\right)^2$	**8**	**1**	**L3**
	c	Prove that $\frac{\rho}{r}$ is a constant for the curve $r = ae^{\theta cot\alpha}$.	**6**	**1**	**L3**
		Module – 2			
Q3	**a**	Obtain the Maclaurin's series of $\sqrt{1 + Sin2x}$.	**6**	**2**	**L2**
	b	If $u = f(x-y, y-z, z-x)$ then prove that $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial z}{\partial x} = 0$.	**8**	**2**	**L3**
	c	Examine the extreme values of $f(x, y) = x^3 + y^3 - 3x - 12y + 20$.	**6**	**2**	**L3**
		OR			
Q4	**a**	Find the value of $\lim_{x\to 0}\left(\frac{a^x + b^x + c^x + d^x}{4}\right)^{\frac{1}{x}}$	**6**	**2**	**L2**
	b	If $u = f(2x-3y,\ 3y-4z,\ 4z-2x)$ then prove that $\frac{1}{2}\frac{\partial u}{\partial x} + \frac{1}{3}\frac{\partial u}{\partial y} + \frac{1}{4}\frac{\partial u}{\partial z} = 0$	**8**	**2**	**L3**
	c	If $u = \frac{yz}{x}$, $v = \frac{zx}{y}$, $w = \frac{xy}{z}$ then prove that $\frac{\partial(u,v,w)}{\partial(x,y,z)} = 4$	**6**	**2**	**L3**
		Module – 3			
Q5	**a**	Find the general solution for $(2x + y + 1)dx + (x + 2y + 1)dy = 0$.	**6**	**3**	**L2**

	b	Solve $\frac{dy}{dx} - \frac{2y}{x} = x + x^2$.	**8**	**3**	**L3**
	c	Test the orthogonal trajectories of the family of curves $\frac{x^2}{a^2} + \frac{y^2}{b^2+\lambda} = 1$, where ' λ ' is the parameter.	**6**	**3**	**L4**
		OR			
Q6	**a**	Find the general solution for $y(2x - y + 1)dx + x(3x - 4y + 3)dy = 0$.	**6**	**3**	**L2**
	b	Solve $xy\left(\frac{dy}{dx}\right)^2 - (x^2+y^2)\frac{dy}{dx} + xy = 0$.	**8**	**3**	**L3**
	c	A copper ball originally at $80^\circ C$ cools down to $60^\circ C$ in 20 minutes if the temperature of the air being $40^\circ C$. what will be the temperature of the ball after 40 minutes from the original.	**6**	**3**	**L4**
		Module – 4			
Q7	**a**	Find the general solution for $(D^2 - 4D + 4)y = sin2x$	**6**	**3**	**L2**
	b	Solve $x^2y'' - 3xy' + 4y = (1 + x)^2$	**8**	**3**	**L3**
	c	Solve by the method of variation of parameters $y'' - 6y' + 9y = \frac{e^{3x}}{x^2}$	**6**	**3**	**L3**
		OR			
Q8	**a**	Find the general solution for $(D^2 + 2D + 1)y = (2x + x^2)$.	**6**	**3**	**L2**
	b	Solve $(2x + 1)^2y'' - 6(2x + 1)y' + 16y = 8(2x + 1)^2$.	**8**	**3**	**L3**
	c	Solve the problem of undamped forced vibrations of a spring governed by the equation $(mD^2 + k)y = f(t)$ **,** in the case where the forcing function is $f(t) = A\,sin\omega t$.	**6**	**3**	**L3**
		Module – 5			
Q9	**a**	Find the rank of a matrix $\begin{bmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{bmatrix}$.	**6**	**4**	**L2**
	b	Solve the system of equations by Gauss - Elimination method $x + y + z = 9,\ x - 2y + 3z = 8,\ 2x + y - z = 3.$	**8**	**4**	**L3**
	c	Using modern mathematical tool write a program/code to check the consistency of the equation $x + 2y - z = 1,\ 2x + y + 4z = 2,\ 3x + 3y + 4z = 1.$	**6**	**5**	**L5**
		OR			
Q10	**a**	Find the largest eigen value and the corresponding eigen vector of the matrix by using the power method (Perform 3 iterations) $A = \begin{bmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{bmatrix}$ by taking an initial vector as $[1 \quad 0 \quad 0]^T$.	**6**	**4**	**L2**
	b	Solve the system of equations by Gauss - Jordan method $2x + 5y + 7z = 52,\ 2x + y - z = 0,\ x + y + z = 9.$	**8**	**4**	**L3**
	c	Using modern mathematical tool write a program/code to solve the system of the equations by Gauss - Seidel method $5x - y - z = -3,\quad x - 5y + z = -9,\ 2x + y - 4z = -15.$	**6**	**5**	**L5**

1	S	J	2	4					

SJC INSTITUTE OF TECHNOLOGY

(An Autonomous Institute under VTU, Belagavi)

FIRST SEMESTER B.E DEGREE SUMMER SEMESTER END EXAMINATIONS

SEPTEMBER 2025

Course:	**MATHEMATICS I FOR EC STREAM**		
Course Code:	**BMATE101**	**Branch: ECE**	
Max Marks:	**100**	**Duration:**	**03 Hours**

Note:

1. Answer any FIVE full questions, choosing one full Question from each Module
2. Any missing Data can be suitably assumed.
3. Formula Handbook Permitted.

Q. No.		**Module - 1**	**Marks**	**CO**	**RBTL**
Q1	**a**	Find the Angle between the Two Curves $r = a(1+cos\theta) and\ r = b(1-\cos\theta)$.	**6**	**1**	**L2**
	b	Show that the Radius of curvature of the curve $y = alog(sec\frac{x}{a})$ at any point (x,y) is $a\ sec\left(\frac{x}{a}\right)$.	**8**	**1**	**L2**
	c	With Usual notation Prove that, $\tan\phi = r\frac{d\theta}{dr}$.	**6**	**1**	**L3**
		OR			
Q2	**a**	Find the angle between the radius vector and tangent vector of the curve $r = a(1-\cos\theta)$	**6**	**1**	**L2**
	b	If $r^n = a^n cosn\theta$, then show that $\rho\ varies\ inversly\ as\ r^{n-1}$.	**8**	**1**	**L2**
	c	With usual notation prove that $\frac{1}{p^2} = \frac{1}{r^2} + \frac{1}{r^4}\left(\frac{dr}{d\theta}\right)^2$	**6**	**1**	**L3**
		Module – 2			
Q3	**a**	Find the Maclaurin's Series of $\sqrt{1+Sin2x}$.	**6**	**2**	**L2**
	b	If $u = f(x-y, y-z, z-x)$ then show that $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial z}{\partial x} = 0$.	**8**	**2**	**L2**
	c	Examine the Extreme values (Maximum and minimum values) of $f(x,y) = x^3 + y^3 - 3x - 12y + 20$.	**6**	**2**	**L4**
		OR			
Q4	**a**	Using Maclaurin's series show that $\log(secx + tanx) = x + \frac{x^3}{6} + \frac{x^5}{24} + \cdots$	**6**	**2**	**L2**
	b	If $u = f(\frac{x}{y}, \frac{y}{z}, \frac{z}{x})$ then prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z} = 0$	**8**	**2**	**L2**
	c	Examine the extreme values of $f(x,y) = x^2 + y^2 + 6x - 12$.	**6**	**2**	**L4**
		Module – 3			
Q5	**a**	Find the Solution of $(4xy + 3y^2 - x)dx + x(x+2y)dy = 0$ by using the Equation reducible to an Exact differential equation.	**6**	**2**	**L2**

	b	Solve $\frac{dy}{dx}+\frac{y}{x}=xy^2$	**8**	**2**	**L3**
	c	Solve the Differential $L\left[\frac{di}{dt}\right]+Ri=E$ where An Inductance 2 Henry (H) and a Resistance 20 ohm (Ω) are connected in series with emf (E) volts(V). If the current is initially zero when t=0, find the current at the end of 0.01seconds if E=100V.	**6**	**2**	**L3**
		OR			
Q6	**a**	Find the Orthogonal Trajectories of the Family of curves $\frac{x^2}{a^2}+\frac{y^2}{b^2+\lambda}=1$, where λ is the parameter.	**6**	**2**	**L2**
	b	Solve: $y\left(\frac{dy}{dx}\right)^2+(x-y)\frac{dy}{dx}-x=0$.	**8**	**2**	**L2**
	c	Solve the Equation $(px-y)(py+x)=2p$ by reducing into Clairaut's form by taking the substitution $X=x^2$ and $Y=y^2$.	**6**	**2**	**L3**
		Module – 4			
Q7	**a**	Find the Value of $\int_{-c}^{c}\int_{-b}^{b}\int_{-a}^{a}(x^2+y^2+z^2)dxdydz$.	**6**	**3**	**L2**
	b	By Changing the order of the Integration, Show that the value of $\int_0^{4a}\int_{\frac{x^2}{4a}}^{2\sqrt{ax}} xy\,dy\,dx$ is $\frac{64a^4}{3}$.	**8**	**3**	**L2**
	c	Derive the Relation between Beta and Gamma functions of $\beta(m,n)=\frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$.	**6**	**3**	**L3**
		OR			
Q8	**a**	By changing into polar coordinates, Find the Value of $\int_0^{\infty}\int_0^{\infty} e^{-(x^2+y^2)}\,dx\,dy$.	**6**	**3**	**L2**
	b	Find the Area bounded by Ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ by double integration	**8**	**3**	**L2**
	c	Prove that $\int_0^{\frac{\pi}{2}}\frac{1}{\sqrt{sin\theta}}d\theta\times\int_0^{\frac{\pi}{2}}\sqrt{sin\theta}d\theta=\pi$.	**6**	**3**	**L3**
		Module – 5			
Q9	**a**	Find the Solution of the System of Equations by Gauss Seidel method $10x+y+z=12, x+10y+z=12, x+y+10z=12$.	**6**	**4**	**L2**
	b	Find the the Solution of the System of Equations by Gauss Jordan method $2x+5y+7z=52,\ 2x+y-z=0, x+y+z=9$	**8**	**4**	**L2**
	c	Using Modern mathematical tool write a Program / Code to examine the Consistency of the following system of Equations and Solution $x_1+2x_2-x_3=1,\ 2x_1+x_2+4x_3=2,\ 3x_1+3x_2+4x_3=1$.	**6**	**5**	**L5**
		OR			
Q10	**a**	Find the Rank of the Matrix $\begin{bmatrix}2 & -1 & -3 & -1\\ 1 & 2 & 3 & -1\\ 1 & 0 & 1 & 1\\ 0 & 1 & 1 & -1\end{bmatrix}$	**6**	**4**	**L2**
	b	Find the values of λ and μ for the System of equations $x+y+z=6,\ x+2y+3z=10,\ x+2y+\lambda z=\mu$ having i) Unique Solution, ii) Infinite solution and iii) No solution.	**8**	**4**	**L2**
	c	Using Modern mathematical tool write a program /code to find the Largest Eigen value of $A=\begin{bmatrix}6 & -2 & 2\\ -2 & 3 & -1\\ 2 & -1 & 3\end{bmatrix}$ by Power method.	**6**	**5**	**L5**

1	S	J	2	4					

SJC INSTITUTE OF TECHNOLOGY

(An Autonomous Institute under VTU, Belagavi)

FIRST SEMESTER B.E DEGREE SUMMER SEMESTER END EXAMINATIONS

SEPTEMBER 2025

Course:	**MATHEMATICS-I FOR ME STREAM**		
Course Code:	**BMATM101**	**Branches: ME, AE & AS**	
Max Marks:	**100**	**Duration:**	**03 Hours**

Note:

1. Answer any FIVE full questions, choosing one full Question from each Module.
2. Any missing Data can be suitably assumed.
3. Formula Handbook Permitted.

Q. No.		**Module - 1**	**Marks**	**CO**	**RBTL**
Q1	**a**	Find the angle between the curves $r = a(1-\cos\theta)$ and $r = b(1+\cos\theta)$.	**6**	**1**	**L2**
	b	With usual notation prove that $\tan\phi = r\frac{d\theta}{dr}$.	**8**	**1**	**L2**
	c	If $r^n = a^n sinn\theta$, then show that ρ *varies inversly as* r^{n-1}.	**6**	**1**	**L3**
		OR			
Q2	**a**	Find the angle of intersection between the curves $r^n = a^n Cosn\theta$ and $r^n = b^n Sinn\theta$.	**6**	**1**	**L2**
	b	With usual notation prove that $\frac{1}{p^2} = \frac{1}{r^2} + \frac{1}{r^4}\left(\frac{dr}{d\theta}\right)^2$.	**8**	**1**	**L3**
	c	Prove that the radius of curvature of the curve $x^3 + y^3 = 3axy$ at $(3a/2, 3a/2)$ is $\frac{3a}{8\sqrt{2}}$.	**6**	**1**	**L3**
		Module – 2			
Q3	**a**	Evaluate $\int_{-1}^{1}\int_{0}^{z}\int_{x-z}^{x+z}(x+y+z)dxdydz$.	**6**	**2**	**L2**
	b	By changing into polar coordinates, evaluate $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)}\,dx\,dy$.	**8**	**2**	**L3**
	c	By changing the order of integration, examine the value of $\int_0^1 \int_x^{\sqrt{x}} xy\,dy\,dx$.	**6**	**2**	**L3**
Q4	**a**	Evaluate $\int_{-c}^{c}\int_{-b}^{b}\int_{-a}^{a}(x^2+y^2+z^2)dzdydx$.	**6**	**2**	**L2**
	b	Derive the relation between Beta and Gamma function of $\beta(m,n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$.	**8**	**2**	**L3**
	c	Estimate the area enclosed by the parabolas $y^2 = 4ax$ and $x^2 = 4ay$.	**6**	**2**	**L4**

		Module – 3			
Q5	**a**	Find the solution of $(y^4 + 2y)dx + (xy^3 + 2y^4 - 4x)dy = 0$.	**6**	**3**	**L2**
	b	Solve $\frac{dy}{dx} + y\,tanx = y^3 secx$.	**8**	**3**	**L3**
	c	Obtain the general and singular solution by reducing into clairaut's form (px-y)(py+x) =2p by taking $X=x^2$ and $Y=y^2$.	**6**	**3**	**L4**
		OR			
Q6	**a**	Find the orthogonal trajectories of the family $r^n cosn\theta = a^n$, where a is the parameter.	**6**	**3**	**L2**
	b	Solve $\frac{dy}{dx} - \frac{dx}{dy} = \frac{x}{y} - \frac{y}{x}$.	**8**	**3**	**L3**
	c	A body is heated at 110^0 C and placed in the air at 10^0 C. After an hour its temperature becomes 60^0 C. How much additional time is required to cool to 30^0 C?	**6**	**3**	**L3**
		Module – 4			
Q7	**a**	Find the general solution of $(4D^4 - 4D^3 - 23D^2 + 12D + 36)y = 0$.	**6**	**3**	**L2**
	b	Solve $(D^2 - 4D + 4)y = 8(e^{2x} + \cos 2x)$.	**8**	**3**	**L3**
	c	Solve $\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 9y = \frac{e^{3x}}{x^2}$ using the method of variation of parameters.	**6**	**3**	**L3**
		OR			
Q8	**a**	Find the general solution of $(D^4 - 1)y = 0$	**6**	**3**	**L2**
	b	Solve $(D^3 - 6D^2 + 11D - 6)y = e^{2x}$ by inverse differential operator method	**8**	**3**	**L3**
	c	Solve $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = sin(\,log\,x)$	**6**	**3**	**L3**
		Module – 5			
Q9	**a**	Find the rank of the matrix by reducing it into echelon form $\begin{bmatrix} 2 & -1 & -3 & -1 \\ 1 & 2 & 3 & -1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & -1 \end{bmatrix}$	**6**	**4**	**L2**
	b	Solve by Gauss Jordan Method, $x + y + z = 10, 2x - y + 3z = 19$, $x + 2y + 3z = 22$.	**8**	**4**	**L3**
	c	Using Modern mathematical tool write a program / code to examine the consistency of the following system of equations and solution $x_1+2x_2-x_3=1$, $x_1+2x_2+4x_3=2$, $3x1+3x2+4x_3=1$.	**6**	**5**	**L5**
		OR			
Q10	**a**	Find the solution of the system of equations by Gauss Seidal iteration $10x + y + z = 12, x + 10y + z = 12, x + y + 10z = 12$.	**6**	**4**	**L2**
	b	Test for consistency and solve the equations. $2x + y + 4z = 12, 4x + 11y - z = 33, 8x - 3y + 2z = 20$.	**8**	**4**	**L3**
	c	Using Modern mathematical tool write a program / code to find the largest eigen value of $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$ by power method	**6**	**5**	**L5**

1	S	J	2	4					

SJC INSTITUTE OF TECHNOLOGY

(An Autonomous Institute under VTU, Belagavi)

FIRST SEMESTER B.E DEGREE SUMMER SEMESTER END EXAMINATIONS

SEPTEMBER 2025

Course:	**MATHEMATICS I FOR CS STREAM**		
Course Code:	**BMATS101**	**Branches: CSE, ISE, AIML, CSD, AI & DS**	
Max Marks:	**100**	**Duration:**	**03 Hours**

Note:

1. Answer any FIVE full questions, choosing one full Question from each Module.
2. Any missing Data can be suitably assumed.
3. Formula Handbook Permitted.

Q. No.		**Module – 1**	**Marks**	**CO**	**RBTL**
Q1	**a**	Find the angle between the two polar curves $r = a(1-\cos\theta)$ and $r = b(1+\cos\theta)$.	**6**	**1**	**L2**
	b	With usual notation prove that , $\tan\phi = r\frac{d\theta}{dr}$.	**8**	**1**	**L3**
	c	Derive the Radius of curvature in cartesian form.	**6**	**1**	**L3**
		OR			
Q2	**a**	Find the pedal equation for the curve $r^2 = a^2 sec2\theta$	**6**	**1**	**L2**
	b	With usual notation prove that $\frac{1}{p^2} = \frac{1}{r^2} + \frac{1}{r^4}\left(\frac{dr}{d\theta}\right)^2$	**8**	**1**	**L3**
	c	Prove that $\frac{\rho}{r}$ is a constant for the curve $r = ae^{\theta cot\alpha}$	**6**	**1**	**L3**
		Module – 2			
Q3	**a**	Find the general solution of $xyP^2 - (x^2 + y^2)P + xy = 0$.	**6**	**2**	**L2**
	b	Solve $\frac{dy}{dx} + \frac{y}{x} = y^2x$.	**8**	**2**	**L3**
	c	Test the orthogonal trajectories of the family of curves $\frac{x^2}{a^2} + \frac{y^2}{b^2+\lambda} = 1$, where ' λ ' is the parameter.	**6**	**2**	**L4**
		OR			
Q4	**a**	Find the general solution of $(4xy + 3y^2 - x)dx + x(x + 2y)dy = 0$.	**6**	**2**	**L2**
	b	Solve the equation $y^2(y - px) = x^4p^2$ by reducing to Clairaut's form by taking the substitutions $X = \frac{1}{x}$, $Y = \frac{1}{y}$.	**8**	**2**	**L3**
	c	Test the family of curve $r^n cosn\theta = a^n$ is an orthogonal trajectories.	**6**	**2**	**L4**
		Module – 3			
Q5	**a**	Obtain the Maclaurin's series of $\sqrt{1 + Sin2x}$.	**6**	**3**	**L2**
	b	If $u = f\left(\frac{x}{y}, \frac{y}{z}, \frac{z}{x}\right)$ then prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z} = 0$.	**8**	**3**	**L3**

	c	Examine the extreme values of $f(x,y) = x^3 + y^3 - 3x - 12y + 20$.	**6**	**3**	**L3**
		OR			
Q6	**a**	If $u = e^{ax+by} f(ax - by)$ then find $xu_x + yu_y$.	**6**	**3**	**L2**
	b	If $u = \frac{yz}{x}$, $v = \frac{zx}{y}$, $w = \frac{xy}{z}$ then prove that $\frac{\partial(u,v,w)}{\partial(x,y,z)} = 4$.	**8**	**3**	**L3**
	c	Prove that $f(x,y) = x^3 + y^3 - 3xy + 1$ is minimum at $(1,1)$	**6**	**3**	**L3**
		Module – 4			
Q7	**a**	Find the area of ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ by double integration.	**6**	**3**	**L2**
	b	Prove that $\beta(m,n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$.	**8**	**3**	**L3**
	c	Evaluate $\int_{-c}^{c}\int_{-b}^{b}\int_{-a}^{a}(x^2 + y^2 + z^2)\, dzdydx$.	**6**	**3**	**L4**
		OR			
Q8	**a**	Find the volume of the tetrahedron bounded by the planes $x = 0,\ y = 0,\ z = 0,\ \frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$.	**6**	**3**	**L2**
	b	Prove that $\int_0^{\frac{\pi}{2}} \frac{d\theta}{\sqrt{\sin\theta}} \times \int_0^{\frac{\pi}{2}} \sqrt{\sin\theta}\, d\theta = \pi$.	**8**	**3**	**L3**
	c	Evaluate $\int_0^{\infty}\int_0^{\infty} e^{-(x^2+y^2)} dxdy$ by changing in to polar coordinates.	**6**	**3**	**L4**
		Module – 5			
Q9	**a**	Find the rank of a matrix $\begin{bmatrix} 1 & 2 & 4 & 3 \\ 2 & 4 & 6 & 8 \\ 4 & 8 & 12 & 16 \\ 1 & 2 & 3 & 4 \end{bmatrix}$	**6**	**4**	**L2**
	b	Solve the system of equations by Gauss Seidel method $5x + 2y + z = 12$, $x + 4y + 2z = 15$, $x + 2y + 5z = 20$.	**8**	**4**	**L3**
	c	Using modern mathematical tool write a Program/Code to find the largest eigen value and corresponding eigen vector for the given matrix A = $\begin{pmatrix} 4 & 3 & 2 \\ 1 & 4 & 1 \\ 3 & 10 & 4 \end{pmatrix}$	**6**	**5**	**L5**
		OR			
Q10	**a**	Find the largest eigen value and the corresponding eigen vector of the matrix by using the power method (Perform 3 iterations) $A = \begin{bmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{bmatrix}$ by taking an initial vector as $[1 \quad 0 \quad 0]^T$.	**6**	**4**	**L2**
	b	Solve the system of equations by Gauss Jordan method $2x + 5y + 7z = 52,\ 2x + y - z = 0,\ x + y + z = 9$.	**8**	**4**	**L3**
	c	Using modern mathematical tool write a Program/Code to test the consistency of the equation $2x_1 + x_2 + 4x_3 = 12$, $4x_1 + 11x_2 - x_3 = 33$ $8x_1 - 3x_2 + 2x_3 = 20$.	**6**	**5**	**L5**

1	S	J	2	4					

SJC INSTITUTE OF TECHNOLOGY

(An Autonomous Institute under VTU, Belagavi)

FIRST/SECOND SEMESTER B.E DEGREE SUMMER SEMESTER END EXAMINATIONS

SEPTEMBER 2025

Course:	**APPLIED PHYSICS FOR CV STREAM**		
Course Code:	**BPHYC102/202**	**Branch: Civil**	
Max Marks:	**100**	**Duration:**	**03 Hours**

Note:

1. Answer any FIVE full questions, choosing one full Question from each Module.
2. Any missing Data can be suitably assumed.
3. Formula Handbook Permitted.

Q. No.		**Module - 1**	**Marks**	**CO**	**RBTL**
Q1	**a**	Define Stiffness factor and Discuss the types of Springs and its applications	**6**	**1**	**L1**
	b	Derive expressions for the effective spring constant of springs in series and parallel combinations.	**8**	**1**	**L2**
	c	Evaluate the resonance frequency for a spring of force constant 1974 N/m, Carrying a mass of 2 kg.	**6**	**1**	**L3**
		OR			
Q2	**a**	What are Shock waves and list any three Characteristics of Shock waves.	**6**	**1**	**L1**
	b	Set up the differential equation for Forced Oscillations and assuming the equations of amplitude and phase discuss the dependence of amplitude on the frequency of the applied external periodic force.	**8**	**1**	**L2**
	c	In a Reddy Shock tube experiment, the time taken by shock waves to travel between the two sensors is 180μsec. If the distance between the two sensors is 100mm. calculate the Mach number. Assume that speed of sound is 340m/sec.	**6**	**1**	**L3**
		Module – 2			
Q3	**a**	Define three types of Moduli and discuss stress-strain curve.	**6**	**1**	**L1**
	b	Derive the relation between Young's modulus, Rigidity modulus and Poisson's ratio.	**8**	**1**	**L2**
	c	Calculate the Extension produced in a wire of length 2 m and radius 0.013×10^{-2} m due to a force of 14.7 Newton applied along its length. Given Young's modulus of the material of the wire, $Y=2.01\times10^{11}$ N/m^2.	**6**	**1**	**L3**
		OR			
Q4	**a**	Define Poisson's ratio and write the limitations of Poisson's ratio.	**6**	**1**	**L1**
	b	Explain Beam, Types of beams, bending moment, ductile fracture and brittle fracture.	**8**	**1**	**L2**
	c	Calculate the Poisson's ratio for the material given that $Y=12.25\times10^{10}$ N/m^2 and $n= 4.55\times10^{10}$ N/m^2.	**6**	**1**	**L3**

Module – 3					
Q5	**a**	Define: (i) Laser (ii) Population Inversion (iii)Active medium (iv)Pumping	**4**	**2**	**L1**
	b	Explain construction and working of semiconductor LASER with necessary diagram.	**10**	**2**	**L2**
	c	The numerical aperture of an optical fiber is 0.2 when Surrounded by air. Determine the R.I. of its core given the R.I of the cladding is 1.59. Also find the acceptance angle when the fiber is in water of R.I.1.33.	**6**	**2**	**L3**
OR					
Q6	**a**	Define attenuation and mention the types of attenuation.	**4**	**2**	**L1**
	b	Define V-number, number of modes and discuss the different types of optical fibers along with neat schematic diagrams?	**10**	**2**	**L2**
	c	The average power output of a laser beam of wavelength 650nm and 700nm is 10mW and 15mW respectively. Calculate the number of photons emitted per second by the Laser source in both the cases.	**6**	**2**	**L3**
Module – 4					
Q7	**a**	Mention the working principle of Transmission Electron Microscope (TEM) and its applications	**6**	**3**	**L1**
	b	Describe the Principle, Construction and working of Scanning Electron Microscope (SEM) with neat diagram.	**8**	**3**	**L2**
	c	Determine the crystal size when the peak width is 0.5° and peak position 30° for a cubic crystal. The wavelength of X-rays used is 100A° and the Scherrer's constant K=0.92	**6**	**3**	**L4**
OR					
Q8	**a**	Define Nano materials and Nano composites? Mention different types of Nano materials.	**6**	**3**	**L1**
	b	Explain the construction and working of X-ray diffractometer.	**8**	**3**	**L2**
	c	A beam of monochromatic X-rays is diffracted by Nacl crystal with a glancing angle of 12° for first order. Calculate the wavelength of X-rays if inter planar spacing of the crystal 2.82 A° and analyze the color of Laser light.	**6**	**3**	**L4**
Module – 5					
Q9	**a**	List any four preventions of fire hazards.	**4**	**4**	**L1**
	b	What is Tsunami waves, Enumerate the causes and adverse Effects of tsunami waves.	**10**	**4**	**L2**
	c	Demonstrate an experiment and write the procedure for determination of effective spring constant of the given spring constant of the given springs in series and parallel combinations.	**6**	**5**	**L4**
OR					
Q10	**a**	Brief about the quantitative measurement of earthquake's magnitude by Richter scale	**4**	**4**	**L1**
	b	What is Forest Fires and show the flowchart to detection of Forest fire using remote sensing.	**10**	**4**	**L2**
	c	Evaluate grating constant d and determine wavelength of Laser for 2nd order diffraction. Given Angle of diffraction θ=7.575 degree, number of lines per inch on grating N= 2500.	**6**	**5**	**L4**

1	S	J	2	4					

SJC INSTITUTE OF TECHNOLOGY

(An Autonomous Institute under VTU, Belagavi)

FIRST/SECOND SEMESTER B.E DEGREE SUMMER SEMESTER END EXAMINATIONS

SEPTEMBER 2025

Course:	**APPLIED PHYSICS FOR EC STREAM**		
Course Code:	**BPHYE102/202**	**Branch: EC**	
Max Marks:	**100**	**Duration:**	**03 Hours**

Note:

1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Any missing Data can be suitably assumed.
3. Formula Handbook Permitted.

Q. No.		Module – 1	Marks	CO	RBTL
Q1	a	Define total internal reflection, critical angle, angle of acceptance and numerical aperture of an optical fiber with diagram.	4	1	L1
	b	Derive the expression for Numerical Aperture and with neat diagrams explain different types of optical fiber	10	1	L3
	c	The refractive indices of core and cladding are 1.50 and 1.48 respectively in optical fiber. Calculate the numerical aperture and acceptance angle.	6	1	L3
		OR			
Q2	a	Define Induced Absorption, Spontaneous emission and stimulated emission with suitable diagram	4	1	L1
	b	Derive an expression for Energy Density in terms of Einstein Coefficient's A and B.	10	1	L3
	c	Calculate the ratio of population for a given pair of energy levels corresponding to emission of radiation 694.3 nm at a temperature of 300 K.	6	1	L3
		Module – 2			
Q3	a	Define matter waves, probability density and, Normalization of wave function.	4	2	L1
	b	Solve the Schrodinger wave equation to obtain the Eigen values and Eigen functions for a particle in one dimensional potential well of infinite height.	10	2	L3
	c	An electron is bound in a one dimensional infinite potential well of width 1 Å. Calculate its energy values in ground state and also first two excited states.	6	2	L3
		OR			
Q4	a	Define wave function and mention its properties	4	2	L1
	b	State Heisenberg's uncertainty principle and Show that electron not exists inside the nucleus.	10	2	L3
	c	Calculate the momentum of an electron and the de Broglie wavelength associated with it if its kinetic energy is 1.5 keV.	6	2	L3

Module – 3					
Q5	**a**	Mention the assumptions and any two limitations of classical free electron theory.	**4**	**3**	**L1**
	b	Explain the assumptions and success of quantum free electron theory.	**10**	**3**	**L2**
	c	If a NaCl crystal is subjected to an electric field of 1000 V/m and the resulting Polarization is 4.3×10^{-8} C/m^2, Calculate the dielectric constant of NaCl. (ε_0=8.854×10-^{12}F/M^2)	**6**	**3**	**L3**
OR					
Q6	**a**	Define Fermi Energy, Fermi Factor, Fermi Velocity and, Fermi Temperature.	**5**	**3**	**L1**
	b	Explain polarization with types of polarization in dielectric materials and, Derive Clausius- Mossotti equation.	**10**	**3**	**L2**
	c	Find the temperature at which there is 1% probability that a state with an energy 0.5 eV above Fermi energy is occupied	**5**	**3**	**L3**
Module – 4					
Q7	**a**	Define Law of mass action and mention the expressions for electron and hole concentration in a semiconductor.	**4**	**3**	**L1**
	b	Explain Hall effect with neat diagram and, Obtain the expression for the Hall voltage and Hall coefficient.	**10**	**3**	**L2**
	c	Analyze four probe experiments to get the resistivity of a material and arrangement helps in minimizing contact resistance during measurement	**6**	**3**	**L4**
OR					
Q8	**a**	Write a note on Phototransistor.	**4**	**3**	**L1**
	b	Explain the principle, construction and working of semiconductor laser and Photo-diode.	**10**	**3**	**L2**
	c	The Hall coefficient of a specimen of doped silicon is found to be 3.66×10^{-4} m^3/c. The resistivity of the specimen is 9.93×10^{-3} ohm-m. Obtain the mobility and charge carrier density assuming single carrier concentration. Analyze the type semiconductor.	**6**	**3**	**L4**
Module – 5					
Q9	**a**	Discuss Soft and Hard magnetic materials	**4**	**4**	**L1**
	b	Explain the BCS theory of superconductivity and Meissner Effect.	**10**	**4**	**L2**
	c	Evaluate an experiment to obtain the magnitude of the magnetic field at 20cm distance from a circular coil of wire consisting 100 turns. Each of radius 8cm carries a current of 0.4A.	**6**	**5**	**L4**
OR					
Q10	**a**	Write a note on SQUID.	**4**	**4**	**L1**
	b	Explain the temperature dependence of resistivity for metals and superconductors	**10**	**4**	**L2**
	c	Design an electronic LCR circuit with the inductance value of inductor, to obtain the resonance frequency of 5KHz with the capacitance of a capacitor is 0.01μF.	**6**	**5**	**L4**

1	S	J	2	4					

SJC INSTITUTE OF TECHNOLOGY

(An Autonomous Institute under VTU, Belagavi)

FIRST/SECOND SEMESTER B.E DEGREE SUMMER SEMESTER END EXAMINATIONS

SEPTEMBER 2025

Course:	**APPLIED PHYSICS FOR ME STREAM**		
Course Code:	**BPHYM102**	**Branches: AE, AS & ME**	
Max Marks:	**100**	**Duration:**	**03 Hours**

Note:

1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Any missing Data can be suitably assumed.
3. Formula Handbook Permitted.

Q. No.		Module - 1	Marks	CO	RBTL
Q1	a	Define Miller indices and Mention the procedure to find miller indices of crystal plane.	6	1	L1
	b	Explain seven different types of crystal system. Determine the atomic packing factor (APF) for diamond.	8	1	L2
	c	Calculate the miller indices for (101) (010) (002) (121) (111) and (222) in a cubic unit cell.	6	1	L3
		OR			
Q2	a	Define space lattice, Bravais lattice, unit cell and Primitive cell.	6	1	L1
	b	Derive an expression for interplanar spacing in terms of miller indices.	8	1	L3
	c	Calculate the Atomic Packing factor for SC and BCC structures.	6	1	L3
		Module – 2			
Q3	a	Define stress, strain, young's modulus, rigidity modulus and bulk modulus.	6	1	L1
	b	Derive the expression for bending moment in terms of moment of inertia and hence arrive at the expression for bending moment of circular cross section.	8	1	L3
	c	A metal wire of length 1.5 m is loaded and an elongation of 2mm is produced. If the diameter of wire is 1mm. Find the change in diameter of wire when elongated (where $\sigma = 0.24$)	6	1	L3
		OR			
Q4	a	State Hook's law in elasticity and Describe stress-strain diagram with the help of Hook's law.	6	1	L1
	b	Derive the relation between Y, n and σ with usual notation.	8	1	L3
	c	Calculate the Poisson's ratio for the material given that $Y=12.25\times10^{10}$ N/m^2 and $n= 4.55\times10^{10}$ N/m^2.	6	1	L3
		Module – 3			
Q5	a	Define Nano materials and Nano composites? Mention different types of Nano materials.	6	2	L1
	b	Describe the Principle, Construction and working of Scanning Electron Microscope (SEM) with neat diagram.	8	2	L2

	c	A beam of monochromatic x-rays is diffracted by NaCl crystal with a glancing angle of 12^{o} for first order. Calculate the wavelength of x-rays if inter planar spacing of the crystal is 2.82Å	**6**	**2**	**L3**
		OR			
Q6	**a**	Mention the working principle of Atomic force Microscope (AFM) and its applications	**6**	**2**	**L1**
	b	Describe principle, construction and working of transmission electron microscope (TEM) with a neat sketch.	**8**	**2**	**L2**
	c	Determine the crystalline size when the peak width is 0.5^{o} and position 30^{o} for a cubic crystal. The wavelength of x-rays used is 100 Å and the Scherrer's constant K=0.92.	**6**	**2**	**L3**
		Module – 4			
Q7	**a**	Define Simple Harmonic motion and mention its characteristic properties of SHM.	**4**	**3**	**L1**
	b	What are damped oscillations? Obtain the expression for differential equation of damped oscillations. Discuss the cases over damping, critical damping and under damping for damped oscillations.	**10**	**3**	**L2**
	c	A mass 0.5kg causes an extension 0.03m in a spring and the system is set for oscillations. Compute (i) force constant k of the spring (ii) angular frequency and (iii) Period T of the resulting oscillation.	**6**	**3**	**L4**
		OR			
Q8	**a**	Define Mach number and Mach angle.	**4**	**3**	**L1**
	b	Explain the construction and working of Reddy Shock Tube with a suitable diagram. Give any two applications of shock waves.	**10**	**3**	**L2**
	c	In a Reddy Shock tube experiment, the time taken by shock waves to travel between the two sensors is 180μsec. If the distance between the two sensors is 100mm. calculate the mach number. Assume that speed of sound is 340m/sec.	**6**	**3**	**L4**
		Module – 5			
Q9	**a**	State and explain laws of thermoelectricity.	**6**	**4**	**L1**
	b	Derive $\Delta T = \frac{(P1-P2)}{CP}\left[\frac{2a}{RT} - b\right]$ and hence discuss Three cases	**8**	**4**	**L3**
	c	In a diffraction grating experiment the laser light undergoes second order diffraction for diffraction angles 1.48°. The grating constant d=5 x 10^{-5}m and the distance between grating and screen is 1m. Determine the wavelength of LASER light used in the experiments.	**6**	**5**	**L4**
		OR			
Q10	**a**	Define Seebeck effect, Peltier effect and with their coefficients.	**6**	**4**	**L1**
	b	Explain liquefaction of oxygen by cascade process with neat diagram and applications of thermoelectricity on Exhaust of Automobiles.	**8**	**4**	**L2**
	c	A copper of length 3.6m exhibits variation of resistance from 0.0514Ω to 0.0498Ω with varying temperature from 343K to 333 K respectively. Determine the Fermi energy of a copper material. (Given: density=8930kg/m^3, A= 2.1239 x 10^{-7}m^2).	**6**	**5**	**L4**

1	S	J	2	4					

SJC INSTITUTE OF TECHNOLOGY

(An Autonomous Institute under VTU, Belagavi)

FIRST/SECOND SEMESTER B.E DEGREE SUMMER SEMESTER END EXAMINATIONS

SEPTEMBER 2025

Course:	**APPLIED PHYSICS FOR CSE STREAM**		
Course Code:	**BPHYS102/202**	**Branches: ISE, CSE, AIDS, CSD, AIML**	
Max Marks:	**100**	**Duration:**	**03 Hours**

Note:

1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Any missing Data can be suitably assumed.
3. Formula Handbook Permitted.

Q. No.		Module - 1	Marks	CO	RBTL
Q1	a	Define Wave function and Probability density. Mention the properties of wave function.	6	1	L1
	b	State the Heisenberg's Uncertainty. Show the non existence of electron inside the nucleus.	10	1	L2
	c	Calculate the de-Broglie wavelength of electron moving with $1/10^{th}$ part of speed of light.	4	1	L3
		OR			
Q2	a	Obtain an expression for de-Broglie wavelength with usual notation	6	1	L1
	b	Derive an expression for Schrodinger's one dimensional time independent wave equation.	10	1	L2
	c	An electron is bound in one dimensional potential well of width 0.12mm. Find its energy values in the ground state and first two excited states in eV and also find the de Broglie wavelength for ground state.	4	1	L3
		Module – 2			
Q3	a	Define a bit and qubit. Mention the properties of Qubit	6	2	L1
	b	Explain the CNOT gate operation on four different input states with truth table, matrix representation.	8	2	L2
	c	Operate Pauli matrices on the states $\|0\rangle$ and $\|1\rangle$.	6	2	L3
		OR			
Q4	a	Define the orthogonality and orthonormality with an example.	6	2	L1
	b	Discuss the working of phase gate with matrix representation and truth table and explain moors law and its end	8	2	L2
	c	A linear operator 'X' operates such that X I0> = I1> and X I1>=I0>. Find the matrix representation of 'X'.	6	2	L3
		Module – 3			
Q5	a	Briefly explain the requisites of the Laser	6	3	L1
	b	Derive an expression for energy density at thermal equilibrium in terms of Einstein coefficients.	8	3	L3

	c	Identify the acceptance angle and Numerical Aperture of a given optical fiber with given data of mean diameter of the circle is 2.45 cm for distance between output end of optical fiber and screen is 4 cm.	**6**	**3**	**L4**
		OR			
Q6	**a**	Based on the refractive index profile and number of modes the fiber supports, discuss the any two types of optical fibers with neat schematic diagrams?	**6**	**3**	**L1**
	b	Describe the construction & working of Semiconductor diode Laser with suitable diagram.	**8**	**3**	**L3**
	c	Identify the wavelength of the laser using the concept of diffraction with given data grating constant d=5.08 x10^{-3} cm, θ=1.6° for 2nd order diffraction.	**6**	**3**	**L4**
		Module – 4			
Q7	**a**	Discuss the Success Quantum free Electron theory of Metals	**6**	**4**	**L2**
	b	Explain Hall effect and Derive an expression for Hall voltage and Hall coefficient.	**8**	**4**	**L3**
	c	Calculate the probability of an electron occupying energy an energy level 0.02eV above Fermi level at 200K, 300K and 400K in a material.	**6**	**4**	**L4**
		OR			
Q8	**a**	Discuss the failures of classical free electron theory	**6**	**4**	**L2**
	b	Define Fermi Factor? Discuss the variation of fermi factor with temperature and energy.	**8**	**4**	**L3**
	c	Find the relaxation time of conduction electrons in a metal of resistivity 1.54X10^{-8} ohm-m, if the metal has 5.8X10^{28} conduction electrons per m^3	**6**	**4**	**L4**
		Module – 5			
Q9	**a**	Describe Type I and Type II superconductors	**6**	**4**	**L1**
	b	Explain the temperature dependence of resistivity for metals and superconductors.	**8**	**4**	**L3**
	c	A superconducting Tin has a critical temperature of 3.7K at zero magnetic fields and a critical field of 0.0306 Tesla at 0 K. Evaluate the critical field at 1K and 2K.	**6**	**4**	**L5**
		OR			
Q10	**a**	Write a note on High temperature Superconductors	**6**	**4**	**L1**
	b	What is Superconductivity? Explain BCS theory of super conductivity.	**8**	**4**	**L3**
	c	A Lead material works as superconductor at temperature of 7.26K. If the constant characteristic field of the material at 0K is 8x105Am-1. Evaluate the magnetic in the Lead at 2K and 5K.	**6**	**4**	**L5**

SJC INSTITUTE OF TECHNOLOGY
(An Autonomous Institute under VTU, Belagavi)
FIRST/SECOND SEMESTER B.E DEGREE SUMMER SEMESTER END EXAMINATIONS
SEPTEMBER 2025

Course:	**SAAMSKRUTHIKA KANNADA**		
Course Code:	**BSKA107/207**	**Branch: All Branches**	
Max Marks:	**50**	**Duration:**	**1 Hour**

INSTRUCTIONS TO THE CANDIDATES

1. Use only **Black ball point pen** for writing/ darkening the circle
2. Answer all the **fifty** questions, each question carries one mark.
3. For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the **OMR** sheet.
4. Darkening two circles for the same question makes the answer invalid.

Q.NO	Questions	Marks	CO	RBTL
1.	ಕರ್ನಾಟಕ ರಾಜ್ಯದ ಮೊದಲ ಹೆಸರು ಯಾವುದು ? a) ಮೈಸೂರು b) ಮಂಡ್ಯ c) ಬಳ್ಳಾರಿ d) ಹಾವೇರಿ	1	1	L1
2.	ವಿಜಯನಗರ ಸಾಮ್ರಾಜ್ಯವನ್ನು _____ನದಿ ತೀರದಲ್ಲಿ ಸ್ಥಾಪಿಸಿದರು. a) ಕಾವೇರಿ b) ತುಂಗಾ c) ಯಮುನಾ d) ಗಂಗ	1	1	L1
3.	"ಕನ್ನಡದ ಲಿಪಿಗಳ ರಾಣಿ" ಎಂದು ಕರೆದವರು ಯಾರು ? a)ಕುವೆಂಪು b)ಮಾಸ್ತಿ c) ಗೋವಿಂದ ಪೈ d) ವಿನೋಬಾ ಭಾವೆ	1	1	L1
4.	1800 ರಲ್ಲಿ ಬಳ್ಳಾರಿ ಜಿಲ್ಲೆಯ ಕಲೆಕ್ಟರ್ ಆಗಿದ್ದವರು ಯಾರು? a) ಸರ್ ಥಾಮಸ್ ಮನ್ರೋ b) ಮಾಸ್ತಿ c) ಆಲೂರು ವೆಂಕಟರಾಯ d) ಬೇಂದ್ರೆ	1	1	L1
5.	ಸುಮಾರು ಎಷ್ಟು ಜನರು ಕನ್ನಡವನ್ನು ಆಡು ನುಡಿಯಾಗಿ ಬಳಸುತ್ತಾರೆ ? a) ಸುಮಾರು 60 ದಶಲಕ್ಷ b)ಸುಮಾರು 50 ದಶಲಕ್ಷ c)ಸುಮಾರು 40 ದಶಲಕ್ಷ d) ಸುಮಾರು 80 ದಶಲಕ್ಷ	1	1	L1
6.	ಕದಂಬ ಸಾಮ್ರಾಜ್ಯದ ಸ್ಥಾಪಕ ಯಾರು? a)ಮಯೂರವರ್ಮ b) ಹಿಮ್ಮಡಿ ಪುಲಕೇಶಿ c) ಹರ್ಷವರ್ಧನ d) ಅಶೋಕ	1	1	L1
7.	ನಮ್ಮ ರಾಜ್ಯದಲ್ಲಿ _____ ಭಾಷಾ ಸೂತ್ರ ಬಳಕೆಯಲ್ಲಿದೆ ? a)ದ್ವಿ b) ಏಕ c) ತ್ರಿ d)ಚತುರ್	1	1	L1
8.	ವಿದ್ಯಾವರ್ಧಕ ಸಂಘವು ಎಷ್ಟರಲ್ಲಿ ಸ್ಥಾಪನೆ ಆಯಿತು ? a)1897 b) 1893 c) 1890 d) 1867	1	1	L1
9.	ರಾಯಚೂರಿನಲ್ಲಿ ನಡೆದ ಕನ್ನಡ ಸಾಹಿತ್ಯ ಸಮ್ಮೇಳನದ ಅಧ್ಯಕ್ಷರು ಯಾರು ? a)ಶ್ರೀರಂಗರು b) ಮಾಸ್ತಿ c) ಶಿವರಾಮ ಕಾರಂತ್ d) ಗೋಪಾಲಕೃಷ್ಣ	1	1	L1
10.	ಬೀದರ್ ನಗರದಲ್ಲಿ ನಡೆದ ಕನ್ನಡ ಸಾಹಿತ್ಯ ಅಧ್ಯಕ್ಷರು ಯಾರು ? a) ಕುವೆಂಪು b) ನರಸಿಂಹಾಚಾರ್ಯ c) ದ. ರ ಬೇಂದ್ರೆ d) ಜಿ ವೆಂಕಟಸುಬ್ಬಯ್ಯ	1	1	L1
11.	ಕರ್ನಾಟಕದ ಏಕೀಕರಣ _____ ರಲ್ಲಿ ಪ್ರಾರಂಭವಾಗಿ ____ ರಲ್ಲಿ ಸಾಧಿತವಾಯಿತು . **a)1890&1956 b) 1890 & 1953 c) 1893 & 1956 d) 1893 & 1953**	1	1	L1
12.	ಕಳ್ಳ ಗಂಜಿ ಕಾಡ ಹೊಕ್ಕಡೆ _____ತಿಂಬುದ ಮಾಬುದೇ? a) ಸರ್ಪ b) ಹುಲಿ c) ಜಿಂಕೆ d) ಸಿಂಹ	1	2	L1
13.	_____ಘನ ವಜ್ರ ಕಿರಿದೆನ್ನಬಹುದೆ ಬಾರದಯ್ಯಾ. a) ಜ್ಯೋತಿ b) ನೆನಪು c)ಮರೆವು d)ಗಿರಿ	1	2	L1

14.	ಕಾಯಕದಲ್ಲಿ ನಿರತನಾದಡೆ _____ ಪೂಜಿಯಾದರು ಮರೆಯಬೇಕು ? a)ಶಿವ b) ಗುರು c) ಲಿಂಗ d) ಜಂಗಮ	1	2	L1
15.	**ಅಂಜಿ ಪದದ ಅರ್ಥವೇನು ?** a)ಆನೆ b) ಭಯ c) ಧೈರ್ಯ d) ದುರ್ಬಲ	1	2	L1
16.	**ಅಲ್ಲಮಪ್ರಭು ಅವರ ಐಕ್ಯ ಸ್ಥಳ ಯಾವುದು ?** a)ಸುರಪುರ b) ಬಿಜಾಪುರ c) ಶ್ರೀಶೈಲ d) ಬಾಗೇವಾಡಿ	1	2	L1
17.	**ಕನ್ನಡದ ಮೊದಲ ಕವಿಯತ್ರಿ ಯಾರು ?** a)ಸುಮತಿ b) ಆಯ್ದಕ್ಕಿ ಲಕ್ಕಮ್ಮ, c) ಅಕ್ಕಮಹಾದೇವಿ d) ಮಾದಲಾಂಬಿಕೆ	1	3	L1
18.	ದುಡಿದವನಿಗೆ _____ ದೊರೆಯಲೇಬೇಕು ? a)ದುಡ್ಡು b)ಪ್ರತಿಫಲ c) ಹಣ d) ಅಧಿಕಾರ	1	3	L1
19.	**ಕರಿ ಪದದ ಅರ್ಥವೇನು ?** a)ಜಿಂಕೆ b) ಸಿಂಹ c) ಆನೆ d) ಹುಲಿ	1	3	L1
20.	**ಕುವೆಂಪು ಅವರ ಯಾವ ಕೃತಿಗೆ ಜ್ಞಾನಪೀಠ ಪ್ರಶಸ್ತಿ ಲಭಿಸಿದೆ ?** a)ನಾಕುತಂತಿ b) ಮೂಕಜ್ಜಿ ಕನಸು c)ಕೊಳಲು d) ಶ್ರೀ ರಾಮಾಯಣ ದರ್ಶನಂ	1	3	L1
21.	**ಜೇಡರ ದಾಸಿಮಯ್ಯನವರ ಕಾಯಕ ಯಾವುದು ?** a)ಅಕ್ಕಿ ಆಯುವುದು b) ವ್ಯವಸಾಯ c) ನೇಯ್ಗೆ d) ಯಾವುದು ಅಲ್ಲ	1	3	L1
22.	**ಕರ್ನಾಟಕದ ಸಂಗೀತ ಪಿತಾಮಹ ಯಾರು ?** a)ರಾಘವಾಂಕರು b) ಜಗನ್ನಾಥರು c) ಕನಕದಾಸರು d) ಪುರಂದರದಾಸರು	1	2	L1
23.	**ಏ ..... ಒಳಿತು ಮಾಡು ಮನುಸ** ನೀ ಇರೋದು _____ದಿವಸ . a) ಆರು b) ಮೂರು c) ನಾಲ್ಕು d) ಒಂದು	1	2	L1
24.	**ಅತಿಯಾಸೆ ಇಲ್ಲದಿದ್ದರೆ ಮನಸ್ಸು ಯಾವಾಗಲೂ _____ ಅನ್ನು ಅನುಭವಿಸುತ್ತದೆ.** a)ಬಡತನ b) ಶ್ರೀಮಂತಿಕೆ c) ಸತ್ಯ d)ಯಾವುದು ಅಲ್ಲ	1	2	L1
25.	**ಒಳಿತು ಮಾಡು ಮನುಸ ಈ ಲೇಖನ ಬರೆದವರು ಯಾರು ?** a)ಋಷಿ b) ಕನಕದಾಸ c) ನೇಮಿಚಂದ್ರ d) ಹಂಪ ನಾಗರಾಜಯ್ಯ	1	2	L1
26.	**“ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗ” ಬರೆದವರು ಯಾರು?** a) ಡಿವಿಜಿ b) ಕುವೆಂಪು c) ಗೋವಿಂದ ಭಟ್ಟ d) ಶಿಶುನಾಳ ಶರೀಫ	1	2	L1
27.	**ಗೌರವಿಸು ಜೀವನವ ಗೌರವಿಸು_____** a)ಜೀವನವ b) ಚೇತನವ c) ಜಗವ d) ಯಾವುದು ಅಲ್ಲ	1	3	L1
28.	**ರಾಷ್ಟ್ರಕವಿ ಬಿರುದು ಯಾರಿಗೆ ದೊರೆತಿತ್ತು ?** a) ಕುವೆಂಪು b) ಮಾಸ್ತಿ c) ಡಿವಿಜಿ d) ಬೇಂದ್ರೆ	1	3	L1
29.	**ಸರ್ವರಿಗೆ ಸಮಬಾಳು ಸರ್ವರಿಗೆ_____** **a**)ಸಮಪಾಲು b) ಸಂಪತ್ತು c) ಸಮಕಾಲ d) ಸಮಜೀವನ	1	2	L1
30.	**ಯಾವ ಸಿಂಹಾಸನಕ್ಕೆ ಕೊನೆಗಾಲ ಬಂದಿರುವುದು ?** a)ಇಂದ್ರ b) ರಾಮ c) ಕೌರವರು d) ಮಂತ್ರಿ	1	3	L1
31.	**ವಿಪ್ಲವ ಪದದ ಅರ್ಥವೇನು ?** a)ಆಟ b) ಕ್ರಾಂತಿ c) ಮಾತು d)ಸ್ವರ್ಗ	1	3	L1
32.	**ಡಾ . ವಿಶ್ವೇಶ್ವರಯ್ಯ ವ್ಯಕ್ತಿ ಮತ್ತು ಲೇಖನದ ಲೇಖಕರು ಯಾರು ?** a)ವಸುಧೇಂದ್ರ b) ಹಿ. ಚಿ ಬೋರಲಿಂಗಯ್ಯ c) ಕರೀಗೌಡ d)ಎ .ಎನ್ ಮೂರ್ತಿರಾವ್	1	3	L1

33.	**ಡಾ .ವಿಶ್ವೇಶ್ವರಯ್ಯ ನವರಿಗೆ ಭಾರತದ ಯಾವ ಪ್ರಶಸ್ತಿ ಲಭಿಸಿದೆ ?** a)ಭಾರತದ ರತ್ನ b) ಮೈಸೂರು ರತ್ನ c) ಕರ್ನಾಟಕ ರತ್ನ d) ಸಮಾಜ ರತ್ನ	**1**	**3**	**L1**
34.	**ಷೇರು ಮಾರುಕಟ್ಟೆ ಎಂದರೆ _____** a)ಷೇರನ್ನುಕೊಳ್ಳುವ ಸ್ಥಳ b) ಮಾರುವ ಸ್ಥಳ c)ಕಂಪನಿ ಮಾರಾಟ ಸ್ಥಳ d) ಅ ಮತ್ತು ಆ	**1**	**3**	**L1**
35.	**ಏಷ್ಯಾದ ಅತ್ಯಂತ ಹಳೆಯ ಸ್ಟಾಕ್ ಮಾರ್ಕೆಟ್ ಯಾವುದು ?** a)ಎನ್ಎಸ್ಇ b) ಟೋಕಿಯ ಎಸ್ಇ c)ಬಿಎಸ್ಇ d)ಎನ್ ವೈ ಎಸ್	**1**	**3**	**L1**
36.	**ಡೆಪಾಸಿಟ್ ಗೆ ಕನ್ನಡದಲ್ಲಿ ಏನೆಂದು ಕರೆಯುತ್ತಾರೆ ?** a)ಸ್ವೀಕಾರ b) ಠೇವಣಿ c) ಅಂಗೀಕಾರ d) ಮುಂಗಡ	**1**	**3**	**L1**
37.	**ಕೃಷ್ಣರಾಜಸಾಗರ ಕಟ್ಟಿಸಿದವರು ಯಾರು ?** a)ನಾಲ್ವಡಿ ಕೃಷ್ಣರಾಜ ಒಡೆಯರ್ b)ದೇವರಾಜ್ c)ಶಂಕರೇಗೌಡd)ವಿಶ್ವೇಶ್ವರಯ್ಯ	**1**	**4**	**L1**
38.	**ಡಾ .ವಿಶ್ವೇಶ್ವರಯ್ಯ ಎಷ್ಟರಲ್ಲಿ ದಿವಾನಗಿರಿಯನ್ನು ತ್ಯಜಿಸಿದರು?** a)1919 b) 1917 c) 1918 d) 1920	**1**	**4**	**L1**
39.	**ಡಾ .ವಿಶ್ವೇಶ್ವರಯ್ಯ ನವರ ಹುಟ್ಟಿದ ವರ್ಷ ಯಾವುದು ?** a)1861 b) 1862 c) 1859 d) 1885	**1**	**4**	**L1**
40.	**ವಿಶ್ವೇಶ್ವರಯ್ಯನವರ ತವರೂರು ಯಾವುದು ?** a) ರಾಣಿಬೆನ್ನೂರು b) ಮೈಸೂರು c) ಮಂಡ್ಯ d) ಮುದ್ದೇನಹಳ್ಳಿ	**1**	**4**	**L1**
41.	**ಕರ್ನಾಟಕ ಗತವೈಭ ಕೃತಿಯ ಕರ್ತೃ ಯಾರು ?** a)ಜಿ ವೆಂಕಟಸುಬ್ಬಯ್ಯb)ದೇವರಾಜ ಅರಸು c) ಆಲೂರುವೆಂಕಟಯರುd)ಯಾರು ಅಲ್ಲ	**1**	**4**	**L1**
42.	**ಷೇರು ಎಂದರೆ _____** a)ಪಾಲು b) ಭಾಗ c) ಘಟಕ d) ಎಲ್ಲವೂ	**1**	**4**	**L1**
43.	**ಗೋಪಣ್ಣ ಏನಾಗಿದ್ದರು ?** a)ಲಾಯರ್ b) ಇಂಜಿನಿಯರ್ c) ಮಾಸ್ಟರ್ d) ವ್ಯಾಪಾರಿ	**1**	**4**	**L1**
44.	**ಪ್ರಹ್ಲಾದನಿಗೆ ಎಷ್ಟನೇ ವರ್ಷಕ್ಕೆ ಮಾತು ಬಂದಿತು ?** a)4 ವರ್ಷ b) 2 ವರ್ಷ c) 3 ವರ್ಷ d) 1 ವರ್ಷ	**1**	**4**	**L1**
45.	**ಗೋಪಣ್ಣ ಮಾಸ್ತರು ಕಣಗಲಿ ಗಿಡದಲ್ಲಿ ಏನು ನೋಡಿದರು ?** **a**)ಹೂ b) ಜನಿವಾರ c) ಬಟ್ಟೆ d) ಹಣ್ಣು	**1**	**4**	**L1**
46.	**"ಸೋಲೆಂಬುದು ಅಲ್ಪವಿರಾಮ" ಈ ಲೇಖನವನ್ನು ಬರೆದವರು ಯಾರು ?** a)ನೇಮಿಚಂದ್ರ b) ಎ.ಎನ್ ಮೂರ್ತಿರಾವ್ c) ಋಷಿ d))ಜಿ ವೆಂಕಟಸುಬ್ಬಯ್ಯ	**1**	**4**	**L1**
47.	**ಸರ್ಕಾರಿ ಆಸ್ಪತ್ರೆಯಲ್ಲಿ ಮಾಸ್ತರಿಗೆ ಸಹಾಯ ಮಾಡಿದ ದಾದಿ ಯಾರು ?** a)ರಾಧಾ b) ಫಾತಿಮಾ c) ಚಾಂದಿನಿ d) ರುಕ್ಮಿಣಿ	**1**	**4**	**L1**
48.	**ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕನ್ನಡ ಈ ಲೇಖನ ಬರೆದವರು ಯಾರು?** a)ಜಿ ವೆಂಕಟಸುಬ್ಬಯ್ಯ b)ಪ್ರೊ.ಎಲ್ .ತಿಮ್ಮೇಶ c)ಕುವೆಂಪು d) ವಿ .ಕೇಶವಮೂರ್ತಿ	**1**	**4**	**L1**
49.	**ಸೋಲು ಈ ಪದದ ವಿರುದ್ಧಾರ್ಥಕ ಪದ__** a)ಗೆಲುವು b)ಸಾವು c) ದ್ವೇಷ d) ನೆಮ್ಮದಿ	**1**	**4**	**L1**
50.	**ಪ್ರಹ್ಲಾದನ ಮನೆ ಗೋಪಣ್ಣನಿಗೆ ಹೇಗೆ ಕಾಣಿಸುತ್ತದೆ ?** a)ಅರಮನೆ b) ಸೆರೆಮನೆ c) ಸ್ವರ್ಗ d) ಇಂದ್ರಪ್ರಸ್ಥ	**1**	**4**	**L1**

1	S	J	2	4					

SJC INSTITUTE OF TECHNOLOGY
(An Autonomous Institute under VTU, Belagavi)

FIRST/SECOND SEMESTER B.E DEGREE SUMMER SEMESTER END EXAMINATIONS

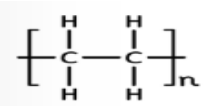
SEPTEMBER 2025

Course:	**APPLIED CHEMISTRY FOR CV STREAM**		
Course Code:	**BCHEC102/202**	**Branch: CV**	
Max Marks:	**100**	**Duration:**	**03 Hours**

Note:

1. Answer any FIVE full questions, choosing one full Question from each Module.
2. Any missing Data can be suitably assumed.
3. Formula Handbook Permitted.

Q. No.		**Module - 1**	**Marks**	**CO**	**RBTL**
Q1	**a**	Mention the properties and applications of Brass.	**6**	**1**	**L1**
	b	Describe the manufacturing of soda-lime glass.	**8**	**1**	**L2**
	c	Elucidate the synthesis process of Portland cement by Highlighting the raw materials, explain the basic steps involved with suitable reactions.	**6**	**1**	**L3**
		OR			
Q2	**a**	Mention the properties and applications of Refractories.	**6**	**1**	**L1**
	b	Interpret the classification of Glass.	**8**	**1**	**L2**
	c	Apply the knowledge of cement to explain the setting & Hardening of Cement.	**6**	**1**	**L3**
		Module – 2			
Q3	**a**	Define Metal Finishing. Mention any five technological importance of metal finishing.	**6**	**2**	**L2**
	b	Calculate the CPR in both mpy and mmpy for a steel of area 30 $inch^2$ which experiences a weight loss of 500g, after 5 months (Density of steel=7.9g/cm^3).	**8**	**2**	**L3**
	c	Apply the knowledge of electrochemical theory of corrosion to explain the rusting of iron, by taking Iron as an example.	**6**	**2**	**L3**
		OR			
Q4	**a**	Define the following i) Differential Metal corrosion ii) Differential Aeration corrosion	**6**	**2**	**L2**
	b	Apply the knowledge of corrosion control & explain the sacrificial anodic method to prevent the iron rod from corrosion, which is buried inside the soil.	**8**	**2**	**L3**
	c	Analyze the type of Corrosion in following cases, Explain with suitable reactions. i) When bolt & nut is made up of same metal. ii) When a ship floating on a sea water corrodes.	**6**	**2**	**L3**

Module – 3					
Q5	**a**	Mention the synthesis, properties & applications of poly Lactic acid.	**6**	**3**	**L2**
	b	Describe the synthesis, properties & applications of Kevlar Fibre.	**8**	**3**	**L3**
	c	A polydisperse sample of polystyrene is prepared by mixing three monodisperse samples in the following proportions.50 molecules have 500 molecular weight, 100 molecules have 1000 molecular weight and 150 molecules have of 1500 molecular weight. Determine number average and weight average.	**6**	**3**	**L3**
OR					
Q6	**a**	Explain the synthesis properties & applications of Poly vinyl Chloride.	**6**	**3**	**L2**
	b	Identify the structure given below, Interpret the synthesis, properties & applications of the same. 	**8**	**3**	**L3**
	c	A polydisperse sample of PVC is prepared by mixing three monodisperse samples in the following proportions.100 molecules have 10000 molecular weight, 150 molecules have 15000 molecular weight and 200 molecules have of 20000 molecular weight. Determine number average and weight average.	**6**	**3**	**L3**
Module – 4					
Q7	**a**	Mention the classification of battery with suitable example.	**6**	**4**	**L1**
	b	Describe the Lead – Silver system with the neat labeled diagram by using condensed Phase rule.	**8**	**4**	**L2**
	c	Outline the Construction, working of calomel electrode with appropriate reactions.	**6**	**4**	**L4**
OR					
Q8	**a**	Define the following terms with examples. i)PV cell ii) Battery iii)Fuel Cell	**6**	**4**	**L1**
	b	Describe the construction & working of Lithium Ion Battery.	**8**	**4**	**L2**
	c	Outline the construction and working of PV cells. Mention its applications	**6**	**4**	**L4**
Module – 5					
Q9	**a**	Define the following. i) Hardness of water ii) COD iii) Desalination	**6**	**5**	**L1**
	b	Describe the synthesis of Nanomaterials by sol-gel method.	**8**	**5**	**L2**
	c	Analyze the COD of the waste water sample. When 38.8 cm^3 and 20.5 cm^3 of 0.05N FAS solution are required for blank and sample titration respectively. The volume of the test sample used is 30cm^3.	**6**	**5**	**L4**
OR					
Q10	**a**	Mention the properties & applications of Carbon Nanotubes.	**6**	**5**	**L1**
	b	Elucidate the desalination of water by Electro dialysis Method.	**8**	**5**	**L2**
	c	Analyze the COD of the waste water sample. When 42 cm^3 and 25.3 cm^3 of 0.04N FAS solution are required for blank and sample titration respectively. The volume of the test sample used is 25cm^3.	**6**	**5**	**L4**

1	S	J	2	4					

SJC INSTITUTE OF TECHNOLOGY

(An Autonomous Institute under VTU, Belagavi)

FIRST/SECOND SEMESTER B.E DEGREE SUMMER SEMESTER END EXAMINATIONS

SEPTEMBER 2025

Course:	**APPLIED CHEMISTRY FOR ME STREAM**		
Course Code:	**BCHEM102/202**	**Branch: ME**	
Max Marks:	**100**	**Duration:**	**03 Hours**

Note:

1. Answer any FIVE full questions, choosing one full Question from each Module.
2. Any missing Data can be suitably assumed.
3. Formula Handbook Permitted.

Q. No.		**Module - 1**	**Marks**	**CO**	**RBTL**
Q1	**a**	Define the following: i) Fuel cells ii) Biodiesel iii) Power alcohol	**6**	**1**	**L1**
	b	Illustrate the determination of calorific value using bomb calorimeter.	**8**	**1**	**L2**
	c	Enumerate the construction and working of Photovoltaic cells with neat labeled diagram.	**6**	**1**	**L3**
		OR			
Q2	**a**	Define the following: i) GCV ii) NCV	**6**	**1**	**L1**
	b	Interpret the construction & working of Lithium-Ion Battery.	**8**	**1**	**L2**
	c	0.85g of coal sample (carbon 90%, H_2 5% and ash 5%) was subjected to Combustion in a bomb calorimeter. Mass of water taken in the calorimeter was 2500g and the water equivalent of the calorimeter was 650 g. The rise in temperature was found to be 3.2°C. Calculate the gross and net calorific values of the sample. Latent heat of steam = 2457 KJ/kg and specific heat of water is 4.187 KJ/ Kg/^{0}C.	**6**	**1**	**L3**
		Module – 2			
Q3	**a**	Define metal finishing. Give technological importance of metal finishing.	**6**	**2**	**L1**
	b	Illustrate the electrochemical theory of corrosion mechanism involved, including anodic and cathodic reactions.	**8**	**2**	**L2**
	c	Calculate the CPR in mpy and mmpy for a steel sheet of area 100 inch2 which experiences a weight loss of 300 gm after one year. (density of steel = 7.8 gm/cm^3).	**6**	**2**	**L3**
		OR			
Q4	**a**	Define the following: i)Sacrificial Anode ii) Differential Aeration Corrosion	**6**	**2**	**L1**
	b	Describe the Galvanization process to protect materials from corrosion.	**8**	**2**	**L2**

	c	Calculate the CPR in mpy and mmpy for a steel sheet of area 100 inch2 which experiences a weight loss of 485 gm after one year. (density of steel = 7.9 gm/cm^3).	**6**	**2**	**L3**
		Module – 3			
Q5	**a**	Define lubricants. Give the classification with an example.	**6**	**3**	**L1**
	b	Outline the synthetic procedure, properties and industrial applications of poly methyl Methacrylate (PMMA).	**8**	**3**	**L2**
	c	In a sample of a polymer, 15% molecules have molecular mass 15000 g/mol, 25% molecules have molecular mass 25000 g/mol, and remaining molecules have molecular mass 30000 g/mol, calculate the number average and weight average molecular mass of the polymer, Calculate PDI and comment on it.	**6**	**3**	**L3**
		OR			
Q6	**a**	Mention the properties and applications of poly lactic acid (PLA).	**6**	**3**	**L1**
	b	Illustrate synthetic procedure, properties and industrial applications of kevlar fibre.	**8**	**3**	**L2**
	c	Illustrate synthetic procedure, properties and industrial applications of Carbon based reinforced composites-graphene.	**6**	**3**	**L3**
		Module – 4			
Q7	**a**	Mention the unique properties and applications of pervoskite materials.	**6**	**4**	**L1**
	b	Describe Electrochemical Gas sensor for the detection of pollutants(NOX)	**8**	**4**	**L2**
	c	Elucidate the composition, properties and applications of Stainless Steel.	**6**	**4**	**L4**
		OR			
Q8	**a**	Define the below terms i) Electrochemical sensors ii) Thermometric gas sensors	**6**	**4**	**L1**
	b	Sketch the preparation step of Soda-lime glass, properties and applications of glass.	**8**	**4**	**L2**
	c	Elucidate the composition, properties and applications of ALnico	**6**	**4**	**L4**
		Module – 5			
Q9	**a**	Define nanomaterial. Mention the following size dependent properties of nanomaterials. i) Surface area ii) Catalytic activity	**6**	**5**	**L1**
	b	Illustrate the Phase diagram of two component-lead-silver system.	**8**	**5**	**L2**
	c	Elucidate the disposal methods of E- waste.	**6**	**5**	**L4**
		OR			
Q10	**a**	Define the following terms with examples, i) Phase Rule ii) Phase Diagram iii) Degree of freedom	**6**	**5**	**L1**
	b	Interpret the properties and engineering applications of carbon nanotubes.	**8**	**5**	**L2**
	c	Enumerate the disposal methods of solid waste.	**6**	**5**	**L4**

1	S	J	2	4					

SJC INSTITUTE OF TECHNOLOGY

(An Autonomous Institute under VTU, Belagavi)

FIRST/SECOND SEMESTER B.E DEGREE SUMMER SEMESTER END EXAMINATIONS

SEPTEMBER 2025

Course:	**APPLIED CHEMISTRY FOR CS STREAM**		
Course Code:	**BCHES102/202**	**Branches: CS, IS, AIML, AIDS, CSD**	
Max Marks:	**100**	**Duration:**	**03 Hours**

Note:

1. Answer any FIVE full questions, choosing one full Question from each Module.
2. Any missing Data can be suitably assumed.
3. Formula Handbook Permitted.

Q. No.		Module - 1	Marks	CO	RBTL
Q1	a	Define the following i) Sensor ii) Actuator iii) Transducer	6	1	L1
	b	Construct the sodium ion battery & explain the working during Discharging & Recharging process.	8	1	L2
	c	Apply the knowledge of sensor, explain the working principle of electrochemical sensors for determination of dissolved oxygen in water.	6	1	L3
		OR			
Q2	a	Define sensor. Explain the determination of Sox and NOx using electrochemical gas sensor	6	1	L1
	b	Describe the working principle of super capacitors with its applications and advantages	8	1	L2
	c	Explain the classification of batteries with an example for each	6	1	L3
		Module – 2			
Q3	a	Mention the properties and applications of PVK & P_3HT.	6	2	L1
	b	Define organic memory devices. Describe the semiconducting behavior of Pentacene in p-type and n-type materials.	8	2	L2
	c	Mention properties and applications of OLED and QLED technologies.	6	2	L3
		OR			
Q4	a	Differentiate between the organic & inorganic memory devices.	6	2	L1
	b	Define Liquid crystals. Give the working principle, properties and applications of Liquid Crystal.	8	2	L2
	c	Summarize the optoelectronic phenomenon and mention the applications of photoactive materials.	6	2	L3
		Module – 3			
Q5	a	Define Cathodic protection. Explain the application of the impressed current method in protecting metal structures.	6	3	L1

	b	Describe the construction and working of a calomel electrode. Mention its applications.	**8**	**3**	**L3**
	c	Estimate the corrosion period (in years) of metal tin bar exposed to environment of summer, the Surface area of 28 inch^2, assume that 35mpy of CPR with a loss of 460grams of tin. The density of tin is 7.31g/cm^3.To calculate time in years.	**6**	**3**	**L3**
		OR			
Q6	**a**	Define i) Ion Selective electrode ii) Reference Electrode iii) CPR	**6**	**3**	**L1**
	b	Define corrosion. Analyze the electrochemical theory of corrosion with iron as a specific example.	**8**	**3**	**L3**
	c	A thick steel sheet of area 230 square inch is exposed to moist air. After 1 year of period, it was found to experience a weight loss 185 g due to corrosion. If the density of brass is 7.18 g/cm3. Calculate CPR in mpy and mmpy.	**6**	**3**	**L3**
		Module – 4			
Q7	**a**	Mention any six advantages of green fuel.	**6**	**4**	**L1**
	b	Interpret synthesis, properties and applications of Kevlar Fiber.	**8**	**4**	**L2**
	c	In a sample of a polymer, 35 % molecules have molecular mass 3500 g/mol, 25% molecules have molecular mass 2500 g/mol, remaining molecules have molecular mass 3500 g /mol. Calculate the number average and weight average molecular mass of the polymer.	**6**	**4**	**L3**
		OR			
Q8	**a**	Define green fuel. Outline the method of production of hydrogen by Proton exchange process.	**6**	**4**	**L1**
	b	Define Photovoltaic cell. Describe the construction and working principle of a photovoltaic cell. Mention the advantages of PV cell.	**8**	**4**	**L2**
	c	In a sample of a polymer, 100 molecules have molecular mass 1500 g/mol, 50 molecules have molecular mass 2500 g/mol, 150 molecules have molecular mass 2000 g /mol. Calculate the number average and weight average molecular mass of the polymer.	**6**	**4**	**L3**
		Module – 5			
Q9	**a**	Mention the sources and composition of E-waste.	**6**	**5**	**L1**
	b	Describe extraction of gold from E-waste by hydrometallurgical method.	**8**	**5**	**L2**
	c	Analyze and differentiate the roles and responsibilities of the following stakeholders in managing E- waste: i) Producers ii) Consumers.	**6**	**5**	**L4**
		OR			
Q10	**a**	Define E-waste. Mention the need of E-waste management.	**6**	**5**	**L1**
	b	Illustrate the following: i)Hydrometallurgy ii)Pyrometallurgy	**8**	**5**	**L2**
	c	Illustrate the ill effects of toxic materials used in Manufacturing electrical and electronic products.	**6**	**5**	**L4**

1	S	J	2	4					

SJC INSTITUTE OF TECHNOLOGY

(An Autonomous Institute under VTU, Belagavi)

FIRST/SECOND SEMESTER B.E DEGREE SUMMER SEMESTER END EXAMINATIONS

SEPTEMBER 2025

Course:	**INTRODUCTION TO ELECTRONICS AND COMMUNICATION**		
Course Code:	**BESC104C**	**Branches: CSE, AI&DS & CSD**	
Max Marks:	**100**	**Duration:**	**03 Hours**

Note:

1. Answer any FIVE full questions, choosing one full Question from each Module.
2. Any missing Data can be suitably assumed.

Q. No.		Module - 1	Marks	CO	RBTL
Q1	a	What are the different types of amplifiers and explain	4	1	L1
	b	Draw the block diagram of regulated power supply and mention the functions of each block	10	1	L2
	c	A half-wave rectifier is fitted with an R–C smoothing filter comprising R = 200 Ω and C = 50 μF. If 2 V of 400 Hz ripple appear at the input of the circuit, Calculate the amount of ripple appearing at the output and discuss the output	6	2	L3
		OR			
Q2	a	Define the Following with respect to the amplifier (i) Gain (ii) Bandwidth	4	1	L1
	b	Explain the bi-phase Full Wave rectifier using center tapped transformer with input and output waveform	10	1	L2
	c	Compute the overall gain of negative feedback amplifier with a suitable block diagram	6	2	L3
		Module – 2			
Q3	a	What are the ideal and practical characteristics of Op-Amp?	6	1	L1
	b	Explain the op-amp based Differentiator and Integrator with the input and output waveform.	8	1	L2
	c	For the following given data compute the summing amplifier output voltage where R_f =10KΩ, R_1=1KΩ, R_2=2KΩ, R_3=3KΩ with V_1=2V, V_2=4V, V_3=6V	6	2	L3
		OR			
Q4	a	What is an Oscillator? List the conditions for sustained oscillations?	6	1	L1
	b	Explain R-C ladder network with a neat circuit diagram	8	1	L2
	c	Construct the following op-amp configuration and compute the voltage gain (i) Inverting amplifier (ii) Non inverting amplifier	6	2	L3
		Module – 3			
Q5	a	State and prove De Morgan's theorem with its truth table	6	2	L1
	b	Explain the D-Flip Flop with the input and output Timing diagram	8	2	L2

	c	Construct full adder circuit with its truth table and write the expressions for sum and carry	**6**	**2**	**L3**
		OR			
Q6	**a**	Write the symbol and truth table for NAND, NOR and NOT gate	**6**	**2**	**L1**
	b	Explain the NOR & NAND based latch.	**8**	**2**	**L2**
	c	Subtract using 2's and 10's Complement method for the following (i) $(1010100\text{-}1000100)_2$ (ii) $(72532 - 3250)_{10}$	**6**	**2**	**L3**
		Module – 4			
Q7	**a**	Explain the working of washing machine with its parts	**6**	**3**	**L1**
	b	With the use of diagram, explain the Elements of an embedded system	**8**	**3**	**L2**
	c	Compare RISC and CISC	**6**	**3**	**L4**
		OR			
Q8	**a**	Define Embedded Systems. Classify embedded systems in detail.	**6**	**3**	**L1**
	b	Explain the major applications of embedded systems with an example	**8**	**3**	**L2**
	c	Distinguish between microprocessor and microcontroller	**6**	**3**	**L4**
		Module – 5			
Q9	**a**	Define modulation discuss the need for modulation	**6**	**4**	**L1**
	b	Explain the Modern communication system with a neat block diagram	**8**	**4**	**L2**
	c	Distinguish Amplitude Modulation (AM) and Frequency Modulation (FM) with a neat sketch	**6**	**4**	**L4**
		OR			
Q10	**a**	List the advantages of digital communication over analog communication	**6**	**4**	**L1**
	b	Explain with a neat diagram, the concept of Radio wave propagation and its different types	**8**	**4**	**L2**
	c	Describe different Multiple Access Techniques	**6**	**4**	**L4**

1	S	J	2	4					

SJC INSTITUTE OF TECHNOLOGY

(An Autonomous Institute under VTU, Belagavi)

FIRST/SECOND SEMESTER B.E DEGREE SUMMER SEMESTER END EXAMINATIONS

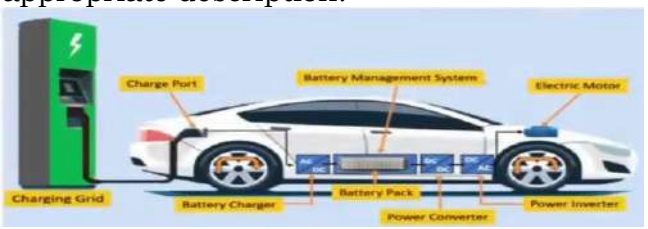
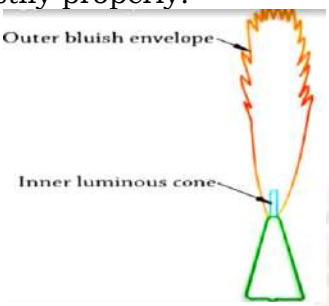
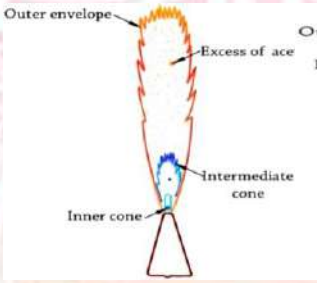
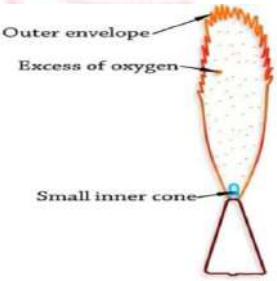
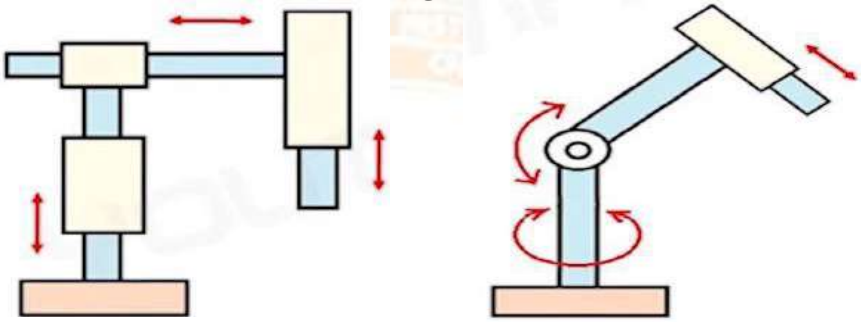
SEPTEMBER 2025

Course:	**FUNDAMENTALS OF MECHANICAL ENGINEERING**		
Course Code:	**BESC104D**	**Branches: CV**	
Max Marks:	**100**	**Duration:**	**03 Hours**

Note:

1. Answer any FIVE full questions, choosing one full Question from each Module.
2. Any missing Data can be suitably assumed.

Q. No.		**Module - 1**	**Marks**	**CO**	**RBTL**
Q1	**a**	Elucidate in detail the Role of Mechanical Engineering in Automotive sector.	**6**	**1**	**L2**
	b	Define hydel energy. With neat sketch explain the construction and working of hydel power plant and write its advantages and disadvantages.	**8**	**1**	**L2**
	c	Expalin the construction and working of nuclear power plant.	**6**	**1**	**L3**
		OR			
Q2	**a**	Write a short note on solution for ozone layer depletion	**6**	**1**	**L2**
	b	Outline the construction & working of wind power plant with a schematic diagram.	**8**	**1**	**L2**
	c	Explain the different types of Fossil fuels & biofuels with applications	**6**	**1**	**L3**
		Module – 2			
Q3	**a**	Define Machine tool. With neat sketch explain drilling and boring operations.	**6**	**2**	**L2**
	b	Elucidate the working principle of milling machine with appropriate sketch.	**8**	**2**	**L3**
	c	Explicate with a block diagram how 3D-printing works.	**6**	**2**	**L3**
		OR			
Q4	**a**	Explain the following: i) Indicated Power, ii) Brake Power	**6**	**2**	**L2**
	b	Differentiate between up milling and down milling with a neat sketch	**8**	**2**	**L3**
	c	With a block diagram illustrate the various components of CNC system.	**6**	**2**	**L3**
		Module – 3			
Q5	**a**	Outline the applications of IC engines.	**4**	**3**	**L2**
	b	What do you mean by an I C engine? Explain in detail the classification of IC Engines.	**10**	**3**	**L3**
	c	Illustrate the Working of 4-Strokes Diesel Engine with P-V diagram	**6**	**3**	**L4**
		OR			
Q6	**a**	Enumerate the advantages and disadvantages of Electric Vehicles?	**4**	**3**	**L2**
	b	Discuss the working principle of Otto cycle engine with PV diagram.	**10**	**3**	**L3**

	c	Identify which type of vehicle is shown in the figure and write a block diagram with appropriate description.  Fig: 6(c)	6	3	L4
		Module – 4			
Q7	a	Write a short note on Shape Memory Alloys.	4	4	L2
	b	Briefly illuminate the different types of Nonferrous materials with applications	8	4	L3
	c	List and explain important mechanical properties of engineering materials.	8	4	L4
		OR			
Q8	a	How engineering materials are classified? List in detail.	4	4	L2
	b	Briefly illuminate the different types of Nonferrous materials with applications	8	4	L3
	c	Recognize the figures of three kinds of flames used in Gas welding and justify properly.  Fig: 8.1  Fig: 8.2  Fig: 8.3	8	4	L4
		Module – 5			
Q9	a	Discuss the characteristics of IoT	4	5	L2
	b	Explain the Concept of open-loop and closed-loop systems.	8	5	L3
	c	Interpret and deliberate the following figures of robotics configuration.  Fig Q9(c)	8	5	L4
		OR			
Q10	a	Describe closed-loop mechatronic system.	4	5	L2
	b	Define robotics and discuss the robot anatomy in detail.	8	5	L3
	c	Define Automation. Explain the three types of Automation and justify suitable automation for repetitive high production work.	8	5	L4

1	S	J	2	4					

SJC INSTITUTE OF TECHNOLOGY

(An Autonomous Institute under VTU, Belagavi)

FIRST/SECOND SEMESTER B.E DEGREE SUMMER SEMESTER END EXAMINATIONS

SEPTEMBER 2025

Course:	**INTRODUCTION TO C PROGRAMMING**		
Course Code:	**BESC104E**	**Branches: ME, AE & AS**	
Max Marks:	**100**	**Duration:**	**03 Hours**

Note:

1. Answer any FIVE full questions, choosing one full Question from each Module.
2. Any missing Data can be suitably assumed.

Q. No.		Module - 1	Marks	CO	RBTL
Q1	a	Define Computer. Describe various types of computer.	6	1	L2
	b	Briefly Illustrate the basic structure/block diagram of a computer.	8	1	L2
	c	Develop a C Program to find Area of Rectangle.	6	3	L3
		OR			
Q2	a	Define variable. Explain the rules to construct variables in C language with an Example.	6	3	L2
	b	Briefly summarize the Basic Structure of C Program with an Example.	8	3	L2
	c	Develop a C Program to compute Area of Circle.	6	3	L3
		Module – 2			
Q3	a	Discuss the and output statements with suitable example.	6	3	L2
	b	Define expression? Evaluate the following expressions . i) 5%10 ii) 10%5 iii) 3*2+5-4 iv) a+b*c-(b/c)	8	2	L2
	c	Develop a C program to find the largest of three numbers.	6	2	L3
		OR			
Q4	a	What is type conversion? Explain with an example.	6	2	L2
	b	List and Explain any four operators used in C language with an example for each.	8	2	L3
	c	Develop a C program that computes the size of int, float, double and char.	6	2	L3

Module – 3					
Q5	**a**	Briefly summarize if and else-if ladder with example for each.	**6**	**3**	**L2**
	b	Construct a C program to find sum of Natural numbers from 1 to N using while loop or for loop.	**8**	**3**	**L3**
	c	Show how break and continue statements are used in a C program with a code snippet.	**6**	**3**	**L3**
OR					
Q6	**a**	Define Function? Briefly Describe the parameter passing techniques to function with an Example.	**6**	**3**	**L2**
	b	Illustrate the different types of storage classes supported by C.	**8**	**3**	**L2**
	c	Define Recursion. Write the recursive code to find the factorial of a given number.	**6**	**3**	**L4**
Module – 4					
Q7	**a**	Define an array ? outline how to declare and initialize one dimensional array with an example	**6**	**4**	**L2**
	b	Develop a C program that reads N integer numbers and arrange them in ascending order using Bubble Sort technique.	**8**	**4**	**L3**
	c	Build a C program to read N numbers into an array & perform Linear search.	**6**	**4**	**L4**
OR					
Q8	**a**	Briefly interpret how to declare and initialize two dimensional array with an example.	**6**	**4**	**L2**
	b	Develop a C Program to Compute an addition of Two matrices.	**8**	**4**	**L3**
	c	Construct a C program to find the sum of two arrays.	**6**	**4**	**L4**
Module – 5					
Q9	**a**	Develop a C program to store and print name, USN and marks of n students using structure.	**6**	**5**	**L3**
	b	Define string? Illustrate any three string manipulation functions with an example for each.	**8**	**5**	**L2**
	c	Construct a C program to find the sum, mean and standard deviation of all elements in an array using pointer	**6**	**5**	**L4**
OR					
Q10	**a**	Define Structure? Briefly describe the syntax of structure declaration with an example.	**6**	**5**	**L2**
	b	Define Pointer? Outline how the pointer variable is declared and initialized with an example.	**8**	**5**	**L3**
	c	Build a C program to find the length of a string without using built in function.	**6**	**5**	**L4**

1	S	J	2	4					

SJC INSTITUTE OF TECHNOLOGY

(An Autonomous Institute under VTU, Belagavi)

FIRST/SECOND SEMESTER B.E DEGREE SUMMER SEMESTER END EXAMINATIONS

SEPTEMBER 2025

Course:	**FUNDAMENTALS OF ELECTRICAL ENGINEERING**		
Course Code:	**BESC104B**	**Branches: ISE, ECE & AIML**	
Max Marks:	**100**	**Duration:**	**03 Hours**

Note:

1. Answer any FIVE full questions, choosing one full Question from each Module.
2. Any missing Data can be suitably assumed.
3. Formula Handbook Permitted.

Q. No.		Module - 1	Marks	CO	RBTL
Q1	a	Explain Ohm's law & state its limitations.	6	1	L2
	b	With a neat diagram explain the construction of D.C. generator.	8	1	L2
	c	Analyse a circuit where an 8Ω resistor is connected in series with a parallel combination of 12Ω and 24Ω resistors, across a 100V supply. Determine, (i) The total current drawn from the supply. (ii) The voltage drops across the 8-ohm resistor. (iii) The individual currents flowing through the 12Ω and 24Ω resistors.	6	3	L3
		OR			
Q2	a	State and Explain the Kirchhoff's Current Law & Kirchhoff's Voltages Law with an Example.	6	1	L2
	b	Explain Back EMF in a D.C motor and its significance	8	1	L2
	c	An 8-ohm resistor is in series with a parallel combination of two resistors 12-ohms and 6-ohms. If the current in 6-ohm resistor is 5A, Construct the circuit, evaluate the total resistance, and determine the value of R.	6	3	L3
		Module – 2			
Q3	a	Explain the following terms i) Instantaneous value ii) Frequency iii) Form-factor with respect to sinusoidal varying quantity. Mention their units.	6	1	L2
	b	Examine that the average power consumed in a pure inductor is zero, using the power expression and analyzing the voltage and current waveforms.	8	4	L3
	c	A resistance of 7Ω is connected in series with a pure inductance of 31.8 mH and the circuit is connected to a 100 V, 50 Hz, sinusoidal supply. Determine the values of, (i) Circuit Current (ii) Power factor (iii) Power.	6	3	L3
		OR			
Q4	a	Describe the following and mention their units. (i)Active power (ii) Reactive power (iii) Apparent power	6	1	L2
	b	Examine that Voltage & Current in pure Resistive circuit are in phase and Power consumed in the circuit is equal to the product of RMS voltage and current.	8	4	L3
	c	A circuit consists of a resistance of 25Ω and capacitance of 100μF, connected in series. A supply of 200V at 50Hz is applied across the circuit. Calculate the current, power factor and power consumed by the circuit.	6	3	L3

Module – 3					
Q5	**a**	Develop the relation between line and phase values in three phase balanced star connection and derive equation for power.	**10**	**4**	**L3**
	b	Three equal impedances, each of having a resistance of 8Ω and inductive reactance of 6Ω are connected in (i) star (ii) Delta, across a 3-phase, 440V system, find phase current, line current and total power consumed in both Star and Delta systems.	**10**	**3**	**L3**
OR					
Q6	**a**	Derive the power consumed in 3 phase circuit using two wattmeter method.	**10**	**4**	**L3**
	b	Three similar choking coils, each having a resistance of 10Ω are connected in Star across a 440V, 3-phase supply. Find the line current and reading of each of the two Watt meters connected to measure power (w_1, w_2).	**10**	**3**	**L3**
Module – 4					
Q7	**a**	A1 KVA single phase transformer has core loss of 15 watts and copper loss of 20 watts. Calculate the efficiency at, (i) Full load, 0.9 power factor(x=1) (ii) Half load, unity power factor (x=1/2) (iii)Three fourth load, 0.707 power factor (x=3/4)	**10**	**3**	**L3**
	b	Analyze the working principle of single-phase Transformer, and derive the expression for induced EMF in primary and secondary winding of a transformer.	**10**	**1**	**L4**
OR					
Q8	**a**	Define Slip. Calculate the Synchronous speed (Ns) and Speed (N) when Slip is 0.04 of a 3-phase Induction motor with 4-pole, supplied from an alternator having 6-poles and running at 1000 rpm.	**10**	**3**	**L3**
	b	Analyze how a rotating magnetic field is produced in the stator of a three-phase induction motor.	**10**	**1**	**L4**
Module – 5					
Q9	**a**	Explain earthing and illustrate Plate and Pipe earthing with neat sketches.	**10**	**2**	**L2**
	b	Define electric shock. Identify the safety precautions to be taken to avoid electric shock.	**10**	**2**	**L3**
OR					
Q10	**a**	With neat circuit diagram and switching table explain two way and three-way control of load.	**10**	**2**	**L2**
	b	Construct a neat block diagram and explain electric vehicles.	**10**	**2**	**L3**

1	S	J	2	4					

SJC INSTITUTE OF TECHNOLOGY

(An Autonomous Institute under VTU, Belagavi)

FIRST/SECOND SEMESTER B.E DEGREE SUMMER SEMESTER END EXAMINATIONS

SEPTEMBER 2025

Course:	**BASIC ELECTRONICS**		
Course Code:	**BBECE103/203**	**Branches: ECE**	
Max Marks:	**100**	**Duration:**	**03 Hours**

Note:

1. Answer any FIVE full questions, choosing one full Question from each Module.
2. Any missing Data can be suitably assumed.

Q. No.		**Module - 1**	**Marks**	**CO**	**RBTL**
Q1	**a**	What is a Diode? Explain the forward and reverse characteristics of a silicon diode	**6**	**1**	**L1**
	b	Demonstrate the working of Full wave rectifier with a neat circuit diagram and necessary waveforms	**8**	**2**	**L2**
	c	In a Full-wave rectifier the input is from 30-0-30V transformer. The load and diode forward resistances are 100 and 10 respectively. Solve for the average voltage, dc output power, ac input power rectification efficiency.	**6**	**3**	**L3**
		OR			
Q2	**a**	Define the various diode approximations	**6**	**1**	**L1**
	b	Outline how a Zener diode can be used as voltage regulator by considering the no load and loaded condition.	**8**	**2**	**L2**
	c	Design a 5V reference source to operate from 10V supply. The circuit is to use a low power Zener diode and is to produce maximum possible load current. Calculate maximum load current that can be taken from the circuit. (Vz=5V, P_D=400mW).	**6**	**3**	**L3**
		Module – 2			
Q3	**a**	Define α and β. Derive the relation between α and β for a NPN transistor.	**6**	**1**	**L1**
	b	Explain input and output characteristics of a BJT common emitter configuration.	**8**	**2**	**L2**
	c	Design the value of I_E, I_C and β_{DC} for a transistor, that has α_{DC}=0.95 and I_B=100μA.	**6**	**3**	**L3**
		OR			
Q4	**a**	Draw the DC load line for transistor and identify Q points.	**6**	**1**	**L1**
	b	Illustrate the construction and operation of Enhancement MOSFET	**8**	**2**	**L2**
	c	Construct the drain characteristics of n-Channel JFET for various characteristics.	**6**	**3**	**L3**
		Module – 3			
Q5	**a**	Define the following parameters of Op-amp i) Bandwidth ii) Slew rate iii) Input offset current	**6**	**1**	**L1**

	b	Describe the block diagram representation of an op-amp. Also describe its Operational behavior with an equivalent circuit.	**8**	**2**	**L2**
	c	An inverting amplifier using op-amp has a feedback resistor of 25KΩ and one input resistor of 1KΩ. Calculate the gain of the op-amp and the output voltage if it supplied with an input 0f 0.5V.	**6**	**3**	**L3**
		OR			
Q6	**a**	List the ideal an practical characteristics of OP-AMP	**6**	**1**	**L1**
	b	Demonstrate a 3 input inverting summer circuit using Op-amp.	**8**	**2**	**L2**
	c	Design Integrator circuit using Op-amp along with waveforms.	**6**	**3**	**L3**
		Module – 4			
Q7	**a**	State and prove De Morgan's theorem for two variables	**6**	**1**	**L2**
	b	Design JK Flip-Flop along with logic diagram and its truth table.	**8**	**3**	**L3**
	c	i)Subtract using 10's complement method 4157.65-3234.74 ii) Subtract using 2's complement method 101110-110110	**6**	**1**	**L4**
		OR			
Q8	**a**	Explain the following Boolean laws i) Commutative Law ii)Distributive Law iii) Associative Law	**6**	**1**	**L2**
	b	Design a Half adder with its logic diagram and deduce the expression for sum and carry.	**8**	**3**	**L3**
	c	Convert the following: i) $(281.6187)_{10}$=(?)2 ii) $(101100101110.11010111)_2$=(?)16 iii) $(635.197)_{10}$=(?)8	**6**	**1**	**L4**
		Module – 5			
Q9	**a**	What is Thermistor? Mention its applications	**6**	**4**	**L1**
	b	Summarize the block diagram of Communication System.	**8**	**4**	**L2**
	c	Analyze the performance of analog Modulation techniques in terms of Bandwidth requirement, Noise immunity and Complexity of implementation	**6**	**4**	**L4**
		OR			
Q10	**a**	What is Modulation? Explain the need for Modulation	**6**	**4**	**L1**
	b	Explain block diagram of Super heterodyne Receiver.	**8**	**4**	**L2**
	c	Write short note on Piezoelectric Transducer	**6**	**4**	**L4**

1	S	J	2	4					

SJC INSTITUTE OF TECHNOLOGY

(An Autonomous Institute under VTU, Belagavi)

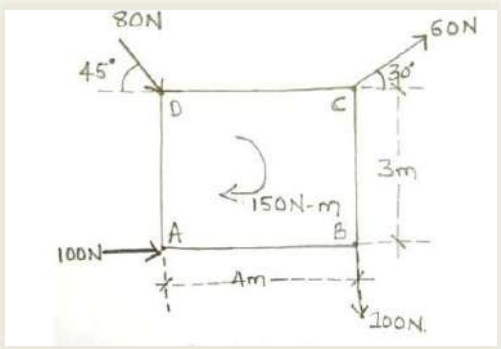
FIRST/SECOND SEMESTER B.E DEGREE SUMMER SEMESTER END EXAMINATIONS

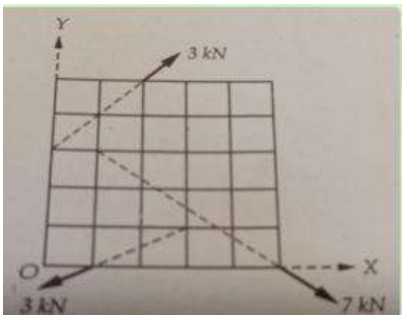
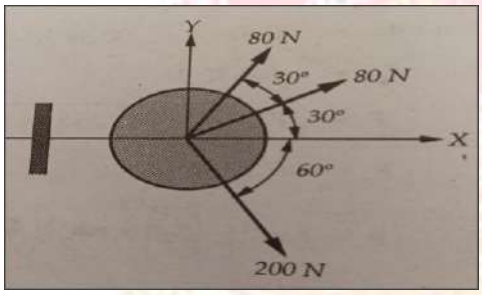
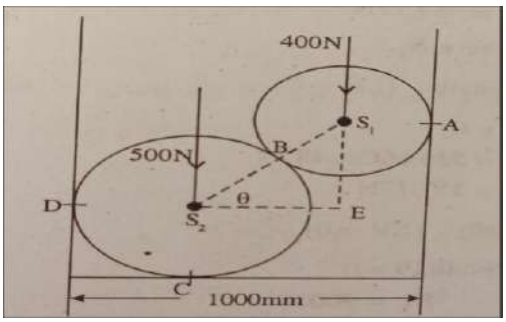
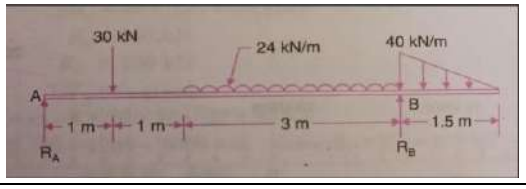
SEPTEMBER 2025

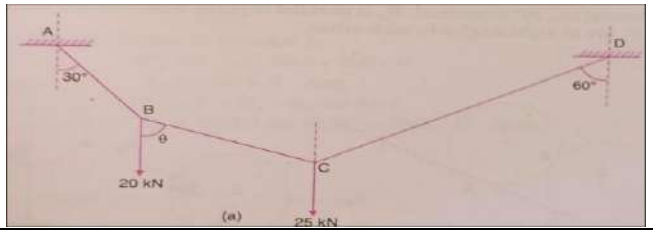
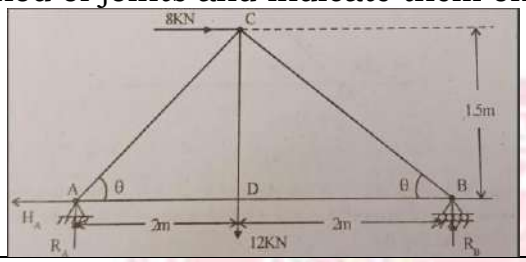
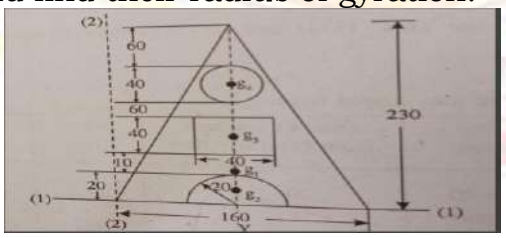
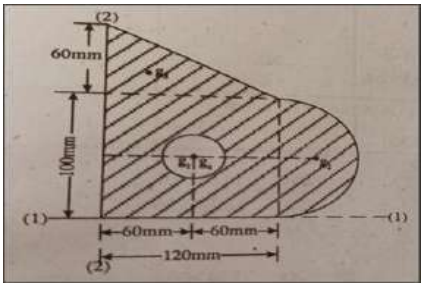
Course:	**ELEMENTS OF CIVIL ENGINEERING**		
Course Code:	**BCIVC103/203**	**Branches: CV**	
Max Marks:	**100**	**Duration:**	**03 Hours**

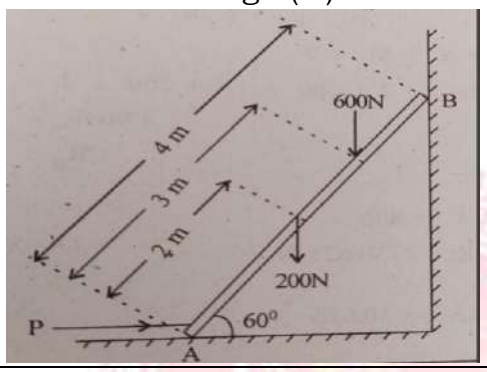
Note:

1. Answer any FIVE full questions, choosing one full Question from each Module.
2. Any missing Data can be suitably assumed.

Q. No.		Module - 1	Marks	CO	RBTL
Q1	a	List the requirements of good bricks?	6	1	L1
	b	Explain briefly the scope of Civil Engineering in: i) Structural Engineering. ii) Transportation Engineering.	8	1	L2
	c	Identify the different roles of civil engineers which contribute to the planning, design, and maintenance of a country's infrastructure?	6	1	L3
		OR			
Q2	a	What makes a building "smart"?	6	1	L1
	b	Elucidate briefly how can civil engineers help reduce pollution?	8	1	L2
	c	Choose which civil engineering concepts are applied in real-world scenarios within: i) Water Resources Engineering ii) Geotechnical Engineering.	6	1	L3
		Module – 2			
Q3	a	Define Couple and its characteristics.	6	2	L2
	b	With neat sketch explain “Principle of Transmissibility of forces”. List its limitations.	8	2	L3
	c	Determine the resultant of the force system acting on the plate as shown in fig.3(c), with respect to AB and AD. 	6	2	L3

		OR			
Q4	**a**	State and prove Varignon's theorem.	**6**	**2**	**L2**
	b	The coplanar forces are acting on a lamina as shown in fig.4(b), where the side of each square is 1m. Solve the force system to get magnitude and position of the resultant.  Fig 4 (b)	**8**	**2**	**L3**
	c	Three forces acting on a hook are as shown in fig.4.2. Determine the direction of the fourth force of magnitude 100N such that the hook is pulled in x direction only. Determine the resultant force in x direction.  Fig 4(c)	**6**	**2**	**L3**
		Module – 3			
Q5	**a**	List the assumptions made in the analysis of simple truss?	**4**	**3**	**L1**
	b	A horizontal channel with an inner clearance of 1000mm carries two spheres of radius 350mm and 250mm whose weights are 500N and 400N respectively. Find the reactions at all the points of contacts.  Fig 5(b)	**10**	**3**	**L3**
	c	Determine the reactions at supports A and B of the overhanging beam shown in fig.5(c)  	**6**	**3**	**L3**

		OR			
Q6	**a**	List different types of supports and its reactions.	**4**	**3**	**L1**
	b	A wire is fixed at A and D as shown in fig.6(b). Weight 20kN and 25kN are supported at B and C respectively. When equilibrium is reached it is found that inclination of AB is 30° and that of CD is 60° to the vertical. Determine the tension in the segments AB, BC and CD of the rope and also the inclination of BC to the vertical. 	**10**	**3**	**L3**
	c	A truss is carrying a vertical force of 12kN and a horizontal force of 8kN as shown in fig.6(C). Find the forces in all the members of the truss by the method of joints and indicate them on the fig. 	**6**	**3**	**L3**
		Module – 4			
Q7	**a**	State parallel axis theorem and perpendicular axes theorem.	**4**	**4**	**L1**
	b	Derive an expression for the centroid of the area enclosed by a right-angled triangle from first principle.	**10**	**4**	**L2**
	c	Determine the moment of inertia of shaded area shown about horizontal axis and find their radius of gyration. 	**6**	**4**	**L3**
		OR			
Q8	**a**	Define radius of Gyration and polar moment of Inertia.	**4**	**4**	**L1**
	b	Derive an expression for moment of inertia of a rectangular area from first principle with respect to its centroidal axis.	**10**	**4**	**L2**
	c	Determine the position of centroid for the lamina with a circular cutout shown in fig.8(c) 	**6**	**4**	**L3**

Module – 5					
Q9	**a**	Define: i) Time of flight ii) Horizontal range iii) Maximum Height	**6**	**5**	**L1**
	b	An aircraft moving horizontally at 120 km/h speed at an elevation of 1200m targets a point on the ground and releases a bomb which hits it. Determine the horizontal distance of the aircraft (position when it releases the bomb) from the target. Also calculate the velocity and direction with which bomb hits the target.	**8**	**5**	**L3**
	c	A ladder of length 4m, weighing 200N is placed against a vertical wall as shown in fig. The coefficient of friction between the wall and the ladder is 0.25 and that between the ladder and the floor is 0.3. Determine the maximum horizontal force to be applied at A to prevent slipping when a man weighing 600N wants to stand at a distance of 3m from A shown in fig 9(c) 	**6**	**5**	**L4**
OR					
Q10	**a**	Define: i) Angle of friction ii) Coefficient of friction iii) Angle of repose.	**6**	**5**	**L1**
	b	A projectile is projected from a point at an angle of elevation of 30° with a velocity of 600 m/sec. Find the velocity and direction of motion of the particle at the end of i) 25 sec, ii) 40 sec.	**8**	**5**	**L3**
	c	A particle falling under gravity falls 30mts in a certain second. Solve for the time required to cover the next 30mts. Take g = 9.8 m/ sec^2.	**6**	**5**	**L4**

1	S	J	2	4					

SJC INSTITUTE OF TECHNOLOGY

(An Autonomous Institute under VTU, Belagavi)

FIRST/SECOND SEMESTER B.E DEGREE SUMMER SEMESTER END EXAMINATIONS

SEPTEMBER 2025

Course:	**ELEMENTS OF MECHANICAL ENGINEERING**		
Course Code:	**BEMEM103/203**	**Branches: ME, AE & AS**	
Max Marks:	**100**	**Duration:**	**03 Hours**

Note:

1. Answer any FIVE full questions, choosing one full Question from each Module.
2. Any missing Data can be suitably assumed.

Q. No.		**Module - 1**	**Marks**	**CO**	**RBTL**
Q1	**a**	What is Engineering materials and classify them in detail.	**6**	**1**	**L1**
	b	Elucidate in detail the Role of Mechanical Engineering in Industries.	**8**	**1**	**L2**
	c	Explain Thermoplastics and Thermosetting plastics and differentiate them.	**6**	**1**	**L3**
		OR			
Q2	**a**	List Emerging trends and technologies in manufacturing sectors.	**6**	**1**	**L1**
	b	Expound Emerging trends and technologies in Energy sectors.	**8**	**1**	**L2**
	c	Identify the applications of Fiber reinforced polymer composites and in detail explain them.	**6**	**1**	**L3**
		Module – 2			
Q3	**a**	Define CNC. Explain the components in advanced CNC system.	**6**	**2**	**L2**
	b	Distinguish between Conventional, CNC and 3D printing machines.	**8**	**2**	**L2**
	c	Explain with sketches any three principal parts of a lathe.	**6**	**2**	**L3**
		OR			
Q4	**a**	Explain with a neat sketch of Fusion welding process.	**6**	**2**	**L2**
	b	Distinguish between Soldering, Brazing and Welding processes.	**8**	**2**	**L2**
	c	Select suitable joining process for Ferrous and Non ferrous material components and discuss why it is suitable.	**6**	**2**	**L3**
		Module – 3			
Q5	**a**	Define the following i) Dryness Fraction ii) Stroke iii) Ice making capacity	**6**	**3**	**L1**
	b	Explain the various stages of steam formation at constant pressure with sketches and also draw T-h diagram.	**8**	**3**	**L2**
	c	Following data are collected from a 4-S single cylinder engine at full load. Bore= 200mm, Stroke = 280mm, speed= 300mm. Indicated	**6**	**3**	**L3**

		mean effective pressure= 5.6 bar. Torque on the brake drum= 250N-m. Fuel consumed = 4.2 kg/hour. Calorific value = 41000 kJ/Kg Determine i) Mechanical efficiency ii) Indicated thermal efficiency iii) Brake thermal efficiency			
		OR			
Q6	**a**	Define the following terms (i) Refrigeration effect (ii) Ton of Refrigeration (iii) COP	**6**	**3**	**L1**
	b	Describe the Principle and operation of Vapour compression Refrigeration system.	**8**	**3**	**L2**
	c	Calculate the brake power output of a single cylinder 4-S petrol engine given: Diameter of brake wheel = 600 mm Brake rope diameter = 30 mm Dead weight = 24 kg Spring balance reading = 4 kg RPM = 450	**6**	**3**	**L3**
		Module – 4			
Q7	**a**	Write a short note on i) Spur gear ii) Bevel Gear iii) Worm gear	**6**	**4**	**L1**
	b	Explain with a neat sketch of working principle of Electric vehicle.	**8**	**4**	**L2**
	c	A simple gear train is made up of 4 gears A, B, C and D having 30, 40,50 and 70 teeth respectively. If gear A is driver rotating at 600 rpm, calculate the speeds of intermediate gears.	**6**	**4**	**L3**
		OR			
Q8	**a**	List and how Hybrid Electric vehicles are classified?	**6**	**4**	**L1**
	b	Distinguish between gears and gear train. Compare Simple and compound gear train.	**8**	**4**	**L2**
	c	Derive the relation for the velocity ratio of simple gear train	**6**	**4**	**L3**
		Module – 5			
Q9	**a**	What is mechatronics and differentiate Open and closed loop system.	**6**	**5**	**L2**
	b	Discuss on the configurations of robot according to their manipulators.	**8**	**5**	**L2**
	c	Analyze any one Feedback control system with block diagram explain the system.	**6**	**5**	**L4**
		OR			
Q10	**a**	Define robot and explain the various components of robot.	**6**	**5**	**L2**
	b	Explain with a neat of how control systems are used in Engine Management system	**8**	**5**	**L2**
	c	Select suitable control systems for Front load Automatic Washing.	**6**	**5**	**L4**

1	S	J	2	4					

SJC INSTITUTE OF TECHNOLOGY

(An Autonomous Institute under VTU, Belagavi)

FIRST/SECOND SEMESTER B.E DEGREE SUMMER SEMESTER END EXAMINATIONS

SEPTEMBER 2025

Course:	**PROBLEM SOLVING THROUGH PROGRAMMING**		
Course Code:	**BPSP103/203**	**Branches: CSE, ISE, AIML, CSD, AI&DS**	
Max Marks:	**100**	**Duration:**	**03 Hours**

Note:

1. Answer any FIVE full questions, choosing one full Question from each Module.
2. Any missing Data can be suitably assumed.

Q. No.		Module - 1	Marks	CO	RBTL
Q1	a	What are the rules to construct an Identifier? Give valid and invalid examples for each rule.	6	1	L1
	b	Explain the structure of C program in detail with an example to demonstrate the components in the structure of C program	8	1	L2
	c	Develop a C program to compute the area of a circle, rectangle, and triangle based on the user's input.	6	1	L3
		OR			
Q2	a	Explain input-output statements in C with an example.	4	1	L2
	b	Write a C program that demonstrates the use of at least 3 basic data types in C (int, float, char) with appropriate input/output.	8	1	L2
	c	Write a program to swap the contents of Two variables	8	1	L3
		Module – 2			
Q3	a	What is an operator? Explain any 4 operators with an example.	6	2	L2
	b	Develop a C program that takes three coefficients (a, b, and c) of a quadratic equation (ax2 + bx + c) as input, computes all possible roots, and prints them with appropriate messages.	8	2	L3
	c	Create a C program where a switch statement is used to perform an arithmetic operation based on the user's choice.	6	2	L3
		OR			
Q4	a	What is the purpose of an if statement in C?	4	2	L1
	b	Illustrate the working of a for loop with an example program.	8	2	L2
	c	Differentiate between a while loop and a Do-while loop.	8	2	L3
		Module – 3			
Q5	a	What are storage classes (ant, Extern, register) in C?	4	3	L1
	b	Explain the declaration and initialization of one-dimensional array with an example	8	3	L2
	c	Apply the bubble sort technique to sort N integer elements in	8	3	L3

		ascending order using arrays.			
		OR			
Q6	**a**	Define an array in C. What are its advantages?	**4**	**3**	**L1**
	b	Develop a C program to add two arrays using two-dimensional arrays.	**8**	**3**	**L3**
	c	Develop a C program to multiply two matrices A and B.	**8**	**3**	**L3**
		Module – 4			
Q7	**a**	Given the following code: int a = 10; int *ptr; What does the statement ptr = &a; do?	**4**	**4**	**L1**
	b	List and interpret any two string-handling functions with suitable examples.	**8**	**4**	**L2**
	c	Develop a C program to find the length of a string without using the built-in function strlen().	**8**	**4**	**L3**
		OR			
Q8	**a**	What is a pointer? How do you declare a pointer to an integer in C?	**4**	**4**	**L1**
	b	Develop a C program to join two strings together using the function strcat() and display the combined string.	**8**	**4**	**L3**
	c	Develop a C program to perform swapping two numbers using pointers.	**8**	**4**	**L3**
		Module – 5			
Q9	**a**	What is Union? How are they declared?	**4**	**5**	**L1**
	b	Illustrate with a suitable example, how to access members of a structure.	**8**	**5**	**L2**
	c	Define a structure called student that contains roll_no, name, and marks. Write a C program to read and display the details of one student.	**8**	**5**	**L3**
		OR			
Q10	**a**	What is a structure in C? How do you declare a structure in C?	**4**	**5**	**L1**
	b	Differentiate between End of File (EOF) and end of input. Why is EOF important in file handling?	**8**	**5**	**L3**
	c	Distinguish between union and structure with an example	**8**	**5**	**L3**

1	S	J	2	4					

SJC INSTITUTE OF TECHNOLOGY

(An Autonomous Institute under VTU, Belagavi)

FIRST/SECOND SEMESTER B.E DEGREE SUMMER SEMESTER END EXAMINATIONS

SEPTEMBER 2025

Course:	**FUNDAMENTALS OF CIVIL ENGINEERING**		
Course Code:	**BESC204A**	**Branches: ME, AE & AS**	
Max Marks:	**100**	**Duration:**	**03 Hours**

Note:

1. Answer any FIVE full questions, choosing one full Question from each Module.
2. Any missing Data can be suitably assumed.

Q. No.		Module - 1	Marks	CO	RBTL
Q1	a	Explain the Good Qualities Bricks & Mortar.	5	1	L2
	b	Explain scope of the following branches of Civil Engineering Disciplines i) Structural Engineering ii) Environmental Engineering iii) Geotechnical Engineering	9	1	L2
	c	Explain the following building materials along with their Properties & Uses in construction. i) Reinforced Cement Concrete ii) Pre-Stressed Concrete	6	1	L3
		OR			
Q2	a	Explain the Characteristics of the Cement & Concrete?	5	1	L2
	b	Explain scope of the following branches of Civil Engineering Disciplines i) Surveying ii) Transportation Engineering ii) Construction Planning & Project Management	9	1	L2
	c	Explain how Lintel and Chejja contribute to the functionality and stability of a building.	6	1	L3
		Module – 2			
Q3	a	List the different types of Force system.	4	2	L1
	b	State and prove Varignon's theorem	6	2	L2
	c	Find the magnitude and direction of the resultant of the coplanar force systems in Fig. 3(c)	10	2	L3

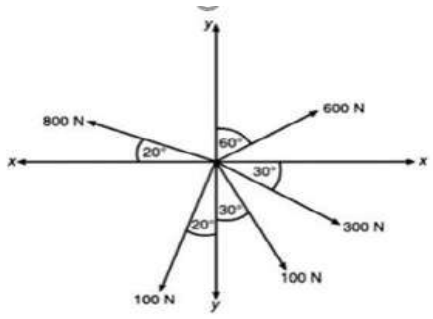
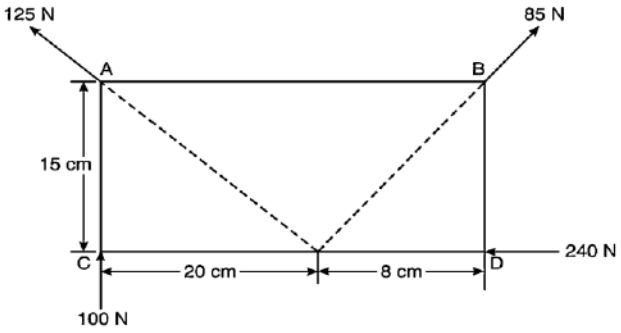
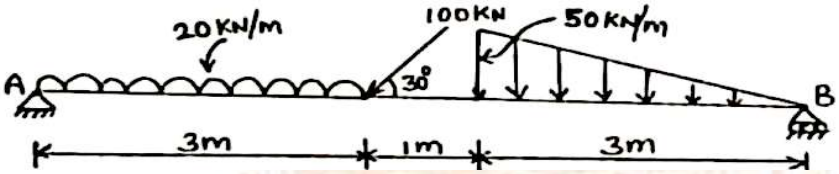
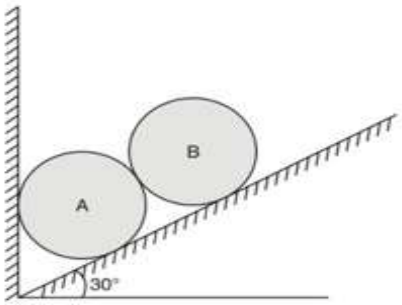
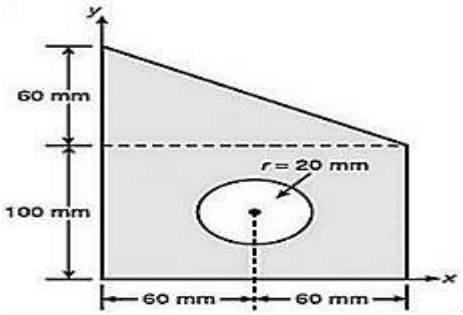
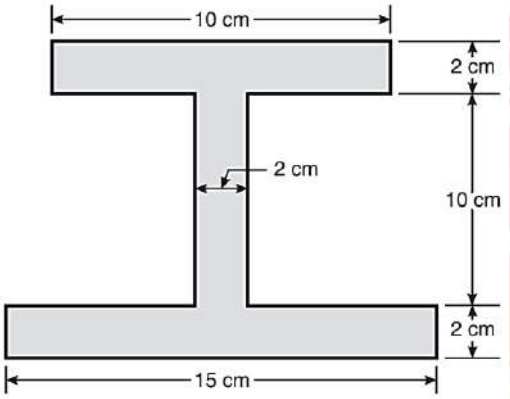


Fig.3(c).

		OR			
Q4	**a**	Define force and its characteristics.	**4**	**2**	**L1**
	b	State and prove Parallelogram law of forces.	**6**	**2**	**L2**
	c	Determine the magnitude, direction and position of the resultant force about point 'A' of the force system, shown in Fig.4(c)  **Fig.4(c)**	**10**	**2**	**L3**
		Module – 3			
Q5	**a**	Illustrate the various types of supports with relevant sketches.	**4**	**3**	**L2**
	b	Describe the various types of beams used in construction with sketches.	**6**	**3**	**L2**
	c	Determine the reactions at the supports for the beam shown in Fig. 5(c)  **Fig. 5(c)**	**10**	**3**	**L3**
		OR			
Q6	**a**	State and prove Lami's theorem.	**4**	**3**	**L2**
	b	Define free-body diagram. With a neat sketch mention the various forces acting on a body.	**6**	**3**	**L2**
	c	Two identical rollers, each weighing 400 N, are placed in a trench as shown in Fig 6(c). Assuming that all contact surfaces are smooth, determine the reactions at contact points.  **Fig.6(c)**	**10**	**3**	**L3**
		Module – 4			
Q7	**a**	Define the terms, (i) Centroid (ii) Symmetrical axis (iii) Axis of reference (iv) Centre of Gravity	**4**	**4**	**L1**
	b	State and prove parallel axis theorem	**6**	**4**	**L2**

	c	Analyze the geometry of the shaded area shown in Fig. 7(c) and determine the coordinates of its centroid with respect to the x and y axes.  **Fig. 7(c)**	10	4	L3
		OR			
Q8	a	Define Moment of Inertia and Radius of gyration	2	4	L1
	b	Determine moment of inertia of a Rectangle about centroidal axis	8	4	L3
	c	Analyze the geometry of the shaded area in Fig. 8(c) and determine its Moment of Inertia about the centroidal axes.  **Fig.8(c)**	10	4	L3
		Module – 5			
Q9	a	Explain the needs of solid waste management and proper method of Landfill sites	6	5	L2
	b	Explain different methods to manage the solid waste in Urban Areas	8	5	L2
	c	Explain infrastructure and types of infrastructure.	6	5	L2
		OR			
Q10	a	Define Sustainable Development Goals. Explain the various sustainable development goals.	6	5	L2
	b	Summarize the needs of Water Supply and Sanitary systems for a cleaner environment.	8	5	L2
	c	Explain the concept of (i) Smart city (ii) Clean city (iii)Safe city	6	5	L2

1	S	J	2	4					

SJC INSTITUTE OF TECHNOLOGY

(An Autonomous Institute under VTU, Belagavi)

FIRST/SECOND SEMESTER B.E DEGREE SUMMER SEMESTER END EXAMINATIONS

SEPTEMBER 2025

Course:	**FUNDAMENTALS OF ELECTRICAL ENGINEERING**		
Course Code:	**BESC204B**	**Branches: CS, CSD & AI&DS**	
Max Marks:	**100**	**Duration:**	**03 Hours**

Note:

1. Answer any FIVE full questions, choosing one full Question from each Module.
2. Any missing Data can be suitably assumed.

Q. No.		Module - 1	Marks	CO	RBTL
Q1	a	State ohm's law and mention the limitations of ohm's law.	6	1	L1
	b	Outline the constructional features of an DC generators.	8	1	L2
	c	A resistance R is connected in series with a parallel circuit consisting of 12Ω and 8Ω respectively. The total power dissipation in the circuit is 70 W, when the applied voltage is 20V. Determine the value of the unknown resistance R	6	3	L3
		OR			
Q2	a	State and Explain the Krichoff's Current Law & Krichoff's Voltage Law with an example.	6	1	L1
	b	Derive the EMF equation of a DC generator and explain the role of key parameters such as flux per pole, number of poles, armature speed, and the number of armature conductors in determining the induced EMF	8	1	L2
	c	An 8-pole generator has 500 armature conductors and has a useful flux per pole of 0.065wb. Identify the emf generated if it is lap connected and runs at 1000rpm? What must be the speed at which it is to be driven to produce the same emf if it is wave wound?	6	3	L3
		Module – 2			
Q3	a	Relate the following terms with respect to a sinusoidal waveform: i) Form factor, ii) Peak factor, iii) Instantaneous value iv) Frequency. v)cycle vi) Amplitude	6	4	L1
	b	Derive the Average value of an AC quantity.	8	4	L2
	c	Analyse the given series circuit consisting of a 20Ω resistor and a 0.05H inductor, connected to a 230V supply at 50Hz. Perform the following. Calculate the current flowing through the circuit. Determine the power factor and the power consumed by the circuit. Construct and explain the vector diagram illustrating the phase relationships between voltage and current in the circuit.	6	3	L3
		OR			
Q4	a	Derive the RMS value of an AC quantity	6	4	L1

	b	Prove that the average power consumed in a pure inductor is zero, using the power expression and Analyzing the voltage and current waveforms.	**8**	**4**	**L2**
	c	Draw and explain with the help of neat circuit diagram and vector diagram showing the component voltages for a series R-L-C circuit under following conditions (i) XC > XL (ii) XL> XC (iii) XL = XC	**6**	**3**	**L3**
		Module – 3			
Q5	**a**	Explain the advantages of three phase systems over single phase systems.	**6**	**4**	**L1**
	b	Derive the power consumed in 3 phase circuit using two wattmeter method	**8**	**4**	**L3**
	c	Three similar coils each having a Resistance of 10Ω & Reactance of 8Ω are connected in Star across 400V, 3-phase supply. Determine, (i) Line Current (ii) Total Power (iii) Reading of each of the two-watt meters connected to measure Power.	**6**	**3**	**L3**
		OR			
Q6	**a**	What is a three-phase system, and how does it differ from a single-phase system?	**6**	**4**	**L1**
	b	Analyze the process of generating a three-phase AC quantity by interpreting the corresponding waveforms and phasor relationships with the help of a diagram.	**8**	**4**	**L3**
	c	Three equal impedances each having a resistance of 8 ohms and inductive reactance of 6 ohms are connected in delta across a 3 phase 440v system find i) Phase current ii)line current iii)Total power	**6**	**3**	**L3**
		Module – 4			
Q7	**a**	Define Transformer. Describe the working principle of a Transformer.	**6**	**1**	**L1**
	b	A 40KVA, single phase transformer has core loss of 450 Watts and full load copper loss 850 Watts. If the power factor of the load is 0.8. Determine, (i)Full load efficiency (ii)Load for maximum efficiency (iii)Maximum efficiency at UPF	**8**	**3**	**L3**
	c	Define slip and slip speed. Obtain an expression for the frequency of rotor current in an induction motor.	**6**	**1**	**L3**
		OR			
Q8	**a**	What are the constructional features of a Squirrel Cage Rotor?	**6**	**1**	**L1**
	b	A single phase 20KVA transformer has 1000 turns and 2500 secondary turns, the net cross section area of the core is 100cm2. When the primary winding is connected to 500V, 50Hz supply. Calculate the following, (i) the maximum value of the flux density in the core (ii) the voltage induced in the secondary winding (iii) the primary and secondary full load currents.	**8**	**3**	**L3**

	c	A three phase, 4 pole, 400V and 50 Hz Induction motor which runs with a speed of 1440 rpm. Calculate its Slip.	**6**	**3**	**L3**
Module – 5					
Q9	**a**	Mention the advantages of Eclectic vehicles.	**4**	**2**	**L1**
	b	Draw and explain the block diagram of an Electric Vehicle system. Describe the function of each block.	**6**	**2**	**L2**
	c	Analyze the two-way control of a load by explaining the circuit diagrams and switching tables. Provide a clear explanation of the operation and how switching combinations affect the load's status.	**10**	**2**	**L4**
OR					
Q10	**a**	What is earthing? Mention the necessity of earthing.	**4**	**2**	**L1**
	b	Write short notes on safety devices.	**6**	**2**	**L2**
	c	Analyze the three-way control of a load by explaining the circuit diagrams and switching tables. Provide a clear explanation of the operation and how switching combinations affect the load's status.	**10**	**2**	**L4**

1	S	J	2	4					

SJC INSTITUTE OF TECHNOLOGY

(An Autonomous Institute under VTU, Belagavi)

FIRST/SECOND SEMESTER B.E DEGREE SUMMER SEMESTER END EXAMINATIONS

SEPTEMBER 2025

Course:	**INTRODUCTION TO C PROGRAMMING**		
Course Code:	**BESC204E**	**Branches: ECE, CV**	
Max Marks:	**100**	**Duration:**	**03 Hours**

Note:

1. Answer any FIVE full questions, choosing one full Question from each Module.
2. Any missing Data can be suitably assumed.

Q. No.		Module - 1	Marks	CO	RBTL
Q1	a	Define Computer. List the various types of computers.	4	1	L1
	b	Demonstrate the basic structure of a C program with an example.	10	1	L2
	c	Construct a simple C program where you declare two integer variables, assign values and print them.	6	1	L3
		OR			
Q2	a	Write a C program to read and print values of different data types using printf() and scanf().	6	1	L2
	b	Convert the following mathematical expression into C equivalent by using C program. i)area= $\sqrt{s(s-a)(s-b)(s-c)}$ ii) x=-b−$\sqrt{(b^2-4ac}$	8	1	L2
	c	Define variable? What are the rules to construct variable? Classify the following as valid/invalid Identifiers. Justify it. i)num2 ii) $num iii) +add iv) a_2 v) 199_space vi) _apple vii) #12	6	1	L3
		Module – 2			
Q3	a	What is an operator? Discuss any two types of operators with an example	6	2	L1
	b	Design a C program to demonstrate type conversion and typecasting, and explain the difference between them.	8	2	L3
	c	Define expression? Evaluate the following expressions. i) 5%10 ii) 10%5 iii) 3*2+5-4 iv) a+b*c-(b/c) where a=3 b=5 and c=8	6	2	L3
		OR			
Q4	a	Discuss the input and output statements with suitable syntax and example.	6	2	L1
	b	Write a program to swap the content of two numbers.	8	2	L2
	c	Develop the C program to find the largest of three numbers	6	2	L3

Module – 3					
Q5	**a**	Explain if-else and if-else-if statements in C with syntax and examples.	**6**	**3**	**L2**
	b	Describe different types of storage classes with an example	**8**	**3**	**L2**
	c	Develop a c-program using function to check whether the given number is even or not	**6**	**3**	**L3**
OR					
Q6	**a**	Explain the use of break and continue statements in C with suitable examples.	**6**	**3**	**L2**
	b	Explain function call, function definition and function prototype(declaration) with examples.	**8**	**3**	**L2**
	c	Develop a C program to find the factorial of a number using recursion.	**6**	**3**	**L3**
Module – 4					
Q7	**a**	Define array? Explain the declaration and initialization of one-dimensional array with an example	**6**	**4**	**L2**
	b	Explain how value of individual array elements can be passed in function with an example.	**8**	**4**	**L2**
	c	Develop a C program to find the element in array by using linear search	**6**	**4**	**L3**
OR					
Q8	**a**	Explain the declaration and initialization of Two-dimensional array with an example	**6**	**4**	**L2**
	b	Develop a C program to read N numbers into an array & sort in ascending order using Bubble sort.	**8**	**4**	**L2**
	c	Develop a C program to transpose the elements of a 3 x 3 matrix	**6**	**4**	**L3**
Module – 5					
Q9	**a**	Define structure? Explain the syntax of structure declaration with an example.	**6**	**5**	**L2**
	b	Illustrate the working of the following string functions. i) Strcat ii) Strlen iii) Strstr iv)Strcpy v)strcmp	**8**	**5**	**L2**
	c	Write a C program to average- marks of student, reading three test marks.	**6**	**5**	**L3**
OR					
Q10	**a**	Explain how the pointer variable declared and initialized? Give the advantages and disadvantages of pointer data type.	**6**	**5**	**L2**
	b	Differentiate between Structure and Union.	**8**	**5**	**L2**
	c	Develop a C program to swap two integer values using pointers.	**6**	**5**	**L3**

1	S	J	2	4					

SJC INSTITUTE OF TECHNOLOGY

(An Autonomous Institute under VTU, Belagavi)

FIRST/SECOND SEMESTER B.E DEGREE SUMMER SEMESTER END EXAMINATIONS

SEPTEMBER 2025

Course:	**INTRODUCTION TO ELECTRONICS AND COMMUNICATION**		
Course Code:	**BESC104C**	**Branches: CSE, AI&DS & CSD**	
Max Marks:	**100**	**Duration:**	**03 Hours**

Note:

1. Answer any FIVE full questions, choosing one full Question from each Module.
2. Any missing Data can be suitably assumed.

Q. No.		Module - 1	Marks	CO	RBTL
Q1	a	What are the different types of amplifiers and explain	4	1	L1
	b	Draw the block diagram of regulated power supply and mention the functions of each block	10	1	L2
	c	A half-wave rectifier is fitted with an R–C smoothing filter comprising R = 200 Ω and C = 50 μF. If 2 V of 400 Hz ripple appear at the input of the circuit, Calculate the amount of ripple appearing at the output and discuss the output	6	2	L3
		OR			
Q2	a	Define the Following with respect to the amplifier (i) Gain (ii) Bandwidth	4	1	L1
	b	Explain the bi-phase Full Wave rectifier using center tapped transformer with input and output waveform	10	1	L2
	c	Compute the overall gain of negative feedback amplifier with a suitable block diagram	6	2	L3
		Module – 2			
Q3	a	What are the ideal and practical characteristics of Op-Amp?	6	1	L1
	b	Explain the op-amp based Differentiator and Integrator with the input and output waveform.	8	1	L2
	c	For the following given data compute the summing amplifier output voltage where R_f =10KΩ, R_1=1KΩ, R_2=2KΩ, R_3=3KΩ with V_1=2V, V_2=4V, V_3=6V	6	2	L3
		OR			
Q4	a	What is an Oscillator? List the conditions for sustained oscillations?	6	1	L1
	b	Explain R-C ladder network with a neat circuit diagram	8	1	L2
	c	Construct the following op-amp configuration and compute the voltage gain (i) Inverting amplifier (ii) Non inverting amplifier	6	2	L3
		Module – 3			
Q5	a	State and prove De Morgan's theorem with its truth table	6	2	L1
	b	Explain the D-Flip Flop with the input and output Timing diagram	8	2	L2

	c	Construct full adder circuit with its truth table and write the expressions for sum and carry	**6**	**2**	**L3**
		OR			
Q6	**a**	Write the symbol and truth table for NAND, NOR and NOT gate	**6**	**2**	**L1**
	b	Explain the NOR & NAND based latch.	**8**	**2**	**L2**
	c	Subtract using 2's and 10's Complement method for the following (i) $(1010100\text{-}1000100)_2$ (ii) $(72532 - 3250)_{10}$	**6**	**2**	**L3**
		Module – 4			
Q7	**a**	Explain the working of washing machine with its parts	**6**	**3**	**L1**
	b	With the use of diagram, explain the Elements of an embedded system	**8**	**3**	**L2**
	c	Compare RISC and CISC	**6**	**3**	**L4**
		OR			
Q8	**a**	Define Embedded Systems. Classify embedded systems in detail.	**6**	**3**	**L1**
	b	Explain the major applications of embedded systems with an example	**8**	**3**	**L2**
	c	Distinguish between microprocessor and microcontroller	**6**	**3**	**L4**
		Module – 5			
Q9	**a**	Define modulation discuss the need for modulation	**6**	**4**	**L1**
	b	Explain the Modern communication system with a neat block diagram	**8**	**4**	**L2**
	c	Distinguish Amplitude Modulation (AM) and Frequency Modulation (FM) with a neat sketch	**6**	**4**	**L4**
		OR			
Q10	**a**	List the advantages of digital communication over analog communication	**6**	**4**	**L1**
	b	Explain with a neat diagram, the concept of Radio wave propagation and its different types	**8**	**4**	**L2**
	c	Describe different Multiple Access Techniques	**6**	**4**	**L4**

1	S	J	2	4					

SJC INSTITUTE OF TECHNOLOGY

(An Autonomous Institute under VTU, Belagavi)

FIRST/SECOND SEMESTER B.E DEGREE SUMMER SEMESTER END EXAMINATIONS

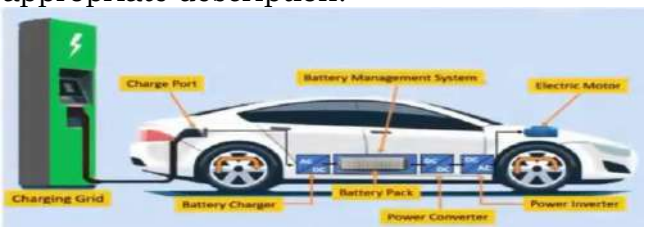
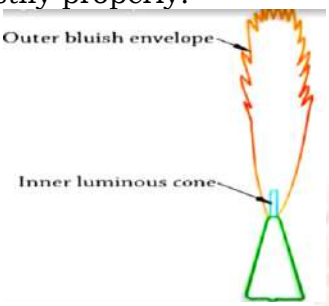
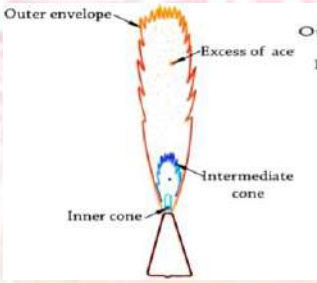
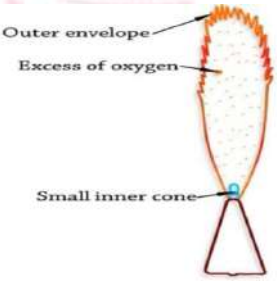
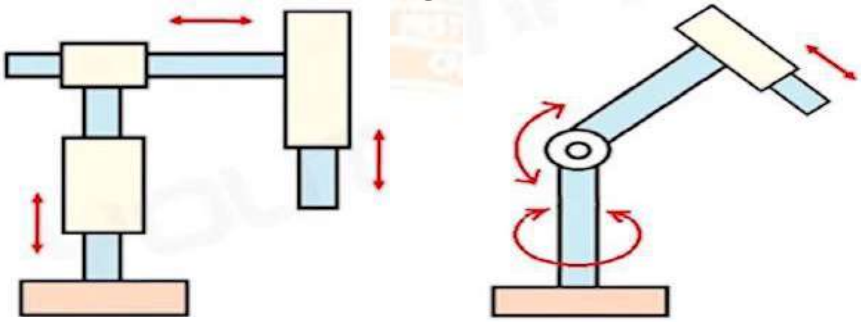
SEPTEMBER 2025

Course:	**FUNDAMENTALS OF MECHANICAL ENGINEERING**		
Course Code:	**BESC104D**	**Branches: CV**	
Max Marks:	**100**	**Duration:**	**03 Hours**

Note:

1. Answer any FIVE full questions, choosing one full Question from each Module.
2. Any missing Data can be suitably assumed.

Q. No.		**Module - 1**	**Marks**	**CO**	**RBTL**
Q1	**a**	Elucidate in detail the Role of Mechanical Engineering in Automotive sector.	**6**	**1**	**L2**
	b	Define hydel energy. With neat sketch explain the construction and working of hydel power plant and write its advantages and disadvantages.	**8**	**1**	**L2**
	c	Expalin the construction and working of nuclear power plant.	**6**	**1**	**L3**
		OR			
Q2	**a**	Write a short note on solution for ozone layer depletion	**6**	**1**	**L2**
	b	Outline the construction & working of wind power plant with a schematic diagram.	**8**	**1**	**L2**
	c	Explain the different types of Fossil fuels & biofuels with applications	**6**	**1**	**L3**
		Module – 2			
Q3	**a**	Define Machine tool. With neat sketch explain drilling and boring operations.	**6**	**2**	**L2**
	b	Elucidate the working principle of milling machine with appropriate sketch.	**8**	**2**	**L3**
	c	Explicate with a block diagram how 3D-printing works.	**6**	**2**	**L3**
		OR			
Q4	**a**	Explain the following: i) Indicated Power, ii) Brake Power	**6**	**2**	**L2**
	b	Differentiate between up milling and down milling with a neat sketch	**8**	**2**	**L3**
	c	With a block diagram illustrate the various components of CNC system.	**6**	**2**	**L3**
		Module – 3			
Q5	**a**	Outline the applications of IC engines.	**4**	**3**	**L2**
	b	What do you mean by an I C engine? Explain in detail the classification of IC Engines.	**10**	**3**	**L3**
	c	Illustrate the Working of 4-Strokes Diesel Engine with P-V diagram	**6**	**3**	**L4**
		OR			
Q6	**a**	Enumerate the advantages and disadvantages of Electric Vehicles?	**4**	**3**	**L2**
	b	Discuss the working principle of Otto cycle engine with PV diagram.	**10**	**3**	**L3**

	c	Identify which type of vehicle is shown in the figure and write a block diagram with appropriate description.  Fig: 6(c)	6	3	L4
		Module – 4			
Q7	a	Write a short note on Shape Memory Alloys.	4	4	L2
	b	Briefly illuminate the different types of Nonferrous materials with applications	8	4	L3
	c	List and explain important mechanical properties of engineering materials.	8	4	L4
		OR			
Q8	a	How engineering materials are classified? List in detail.	4	4	L2
	b	Briefly illuminate the different types of Nonferrous materials with applications	8	4	L3
	c	Recognize the figures of three kinds of flames used in Gas welding and justify properly.  Fig: 8.1  Fig: 8.2  Fig: 8.3	8	4	L4
		Module – 5			
Q9	a	Discuss the characteristics of IoT	4	5	L2
	b	Explain the Concept of open-loop and closed-loop systems.	8	5	L3
	c	Interpret and deliberate the following figures of robotics configuration.  Fig Q9(c)	8	5	L4
		OR			
Q10	a	Describe closed-loop mechatronic system.	4	5	L2
	b	Define robotics and discuss the robot anatomy in detail.	8	5	L3
	c	Define Automation. Explain the three types of Automation and justify suitable automation for repetitive high production work.	8	5	L4

1	S	J	2	4					

SJC INSTITUTE OF TECHNOLOGY

(An Autonomous Institute under VTU, Belagavi)

FIRST/SECOND SEMESTER B.E DEGREE SUMMER SEMESTER END EXAMINATIONS

SEPTEMBER 2025

Course:	**INTRODUCTION TO C PROGRAMMING**		
Course Code:	**BESC104E**	**Branches: ME, AE & AS**	
Max Marks:	**100**	**Duration:**	**03 Hours**

Note:

1. Answer any FIVE full questions, choosing one full Question from each Module.
2. Any missing Data can be suitably assumed.

Q. No.		Module - 1	Marks	CO	RBTL
Q1	a	Define Computer. Describe various types of computer.	6	1	L2
	b	Briefly Illustrate the basic structure/block diagram of a computer.	8	1	L2
	c	Develop a C Program to find Area of Rectangle.	6	3	L3
		OR			
Q2	a	Define variable. Explain the rules to construct variables in C language with an Example.	6	3	L2
	b	Briefly summarize the Basic Structure of C Program with an Example.	8	3	L2
	c	Develop a C Program to compute Area of Circle.	6	3	L3
		Module – 2			
Q3	a	Discuss the and output statements with suitable example.	6	3	L2
	b	Define expression? Evaluate the following expressions . i) 5%10 ii) 10%5 iii) 3*2+5-4 iv) a+b*c-(b/c)	8	2	L2
	c	Develop a C program to find the largest of three numbers.	6	2	L3
		OR			
Q4	a	What is type conversion? Explain with an example.	6	2	L2
	b	List and Explain any four operators used in C language with an example for each.	8	2	L3
	c	Develop a C program that computes the size of int, float, double and char.	6	2	L3

Module – 3					
Q5	**a**	Briefly summarize if and else-if ladder with example for each.	**6**	**3**	**L2**
	b	Construct a C program to find sum of Natural numbers from 1 to N using while loop or for loop.	**8**	**3**	**L3**
	c	Show how break and continue statements are used in a C program with a code snippet.	**6**	**3**	**L3**
OR					
Q6	**a**	Define Function? Briefly Describe the parameter passing techniques to function with an Example.	**6**	**3**	**L2**
	b	Illustrate the different types of storage classes supported by C.	**8**	**3**	**L2**
	c	Define Recursion. Write the recursive code to find the factorial of a given number.	**6**	**3**	**L4**
Module – 4					
Q7	**a**	Define an array ? outline how to declare and initialize one dimensional array with an example	**6**	**4**	**L2**
	b	Develop a C program that reads N integer numbers and arrange them in ascending order using Bubble Sort technique.	**8**	**4**	**L3**
	c	Build a C program to read N numbers into an array & perform Linear search.	**6**	**4**	**L4**
OR					
Q8	**a**	Briefly interpret how to declare and initialize two dimensional array with an example.	**6**	**4**	**L2**
	b	Develop a C Program to Compute an addition of Two matrices.	**8**	**4**	**L3**
	c	Construct a C program to find the sum of two arrays.	**6**	**4**	**L4**
Module – 5					
Q9	**a**	Develop a C program to store and print name, USN and marks of n students using structure.	**6**	**5**	**L3**
	b	Define string? Illustrate any three string manipulation functions with an example for each.	**8**	**5**	**L2**
	c	Construct a C program to find the sum, mean and standard deviation of all elements in an array using pointer	**6**	**5**	**L4**
OR					
Q10	**a**	Define Structure? Briefly describe the syntax of structure declaration with an example.	**6**	**5**	**L2**
	b	Define Pointer? Outline how the pointer variable is declared and initialized with an example.	**8**	**5**	**L3**
	c	Build a C program to find the length of a string without using built in function.	**6**	**5**	**L4**

1	S	J	2	4					

SJC INSTITUTE OF TECHNOLOGY

(An Autonomous Institute under VTU, Belagavi)

FIRST/SECOND SEMESTER B.E DEGREE SUMMER SEMESTER END EXAMINATIONS

SEPTEMBER 2025

Course:	**FUNDAMENTALS OF ELECTRICAL ENGINEERING**		
Course Code:	**BESC104B**	**Branches: ISE, ECE & AIML**	
Max Marks:	**100**	**Duration:**	**03 Hours**

Note:

1. Answer any FIVE full questions, choosing one full Question from each Module.
2. Any missing Data can be suitably assumed.
3. Formula Handbook Permitted.

Q. No.		Module - 1	Marks	CO	RBTL
Q1	a	Explain Ohm's law & state its limitations.	6	1	L2
	b	With a neat diagram explain the construction of D.C. generator.	8	1	L2
	c	Analyse a circuit where an 8Ω resistor is connected in series with a parallel combination of 12Ω and 24Ω resistors, across a 100V supply. Determine, (i) The total current drawn from the supply. (ii) The voltage drops across the 8-ohm resistor. (iii) The individual currents flowing through the 12Ω and 24Ω resistors.	6	3	L3
		OR			
Q2	a	State and Explain the Kirchhoff's Current Law & Kirchhoff's Voltages Law with an Example.	6	1	L2
	b	Explain Back EMF in a D.C motor and its significance	8	1	L2
	c	An 8-ohm resistor is in series with a parallel combination of two resistors 12-ohms and 6-ohms. If the current in 6-ohm resistor is 5A, Construct the circuit, evaluate the total resistance, and determine the value of R.	6	3	L3
		Module – 2			
Q3	a	Explain the following terms i) Instantaneous value ii) Frequency iii) Form-factor with respect to sinusoidal varying quantity. Mention their units.	6	1	L2
	b	Examine that the average power consumed in a pure inductor is zero, using the power expression and analyzing the voltage and current waveforms.	8	4	L3
	c	A resistance of 7Ω is connected in series with a pure inductance of 31.8 mH and the circuit is connected to a 100 V, 50 Hz, sinusoidal supply. Determine the values of, (i) Circuit Current (ii) Power factor (iii) Power.	6	3	L3
		OR			
Q4	a	Describe the following and mention their units. (i)Active power (ii) Reactive power (iii) Apparent power	6	1	L2
	b	Examine that Voltage & Current in pure Resistive circuit are in phase and Power consumed in the circuit is equal to the product of RMS voltage and current.	8	4	L3
	c	A circuit consists of a resistance of 25Ω and capacitance of 100μF, connected in series. A supply of 200V at 50Hz is applied across the circuit. Calculate the current, power factor and power consumed by the circuit.	6	3	L3

Module – 3					
Q5	**a**	Develop the relation between line and phase values in three phase balanced star connection and derive equation for power.	**10**	**4**	**L3**
	b	Three equal impedances, each of having a resistance of 8Ω and inductive reactance of 6Ω are connected in (i) star (ii) Delta, across a 3-phase, 440V system, find phase current, line current and total power consumed in both Star and Delta systems.	**10**	**3**	**L3**
OR					
Q6	**a**	Derive the power consumed in 3 phase circuit using two wattmeter method.	**10**	**4**	**L3**
	b	Three similar choking coils, each having a resistance of 10Ω are connected in Star across a 440V, 3-phase supply. Find the line current and reading of each of the two Watt meters connected to measure power (w_1, w_2).	**10**	**3**	**L3**
Module – 4					
Q7	**a**	A1 KVA single phase transformer has core loss of 15 watts and copper loss of 20 watts. Calculate the efficiency at, (i) Full load, 0.9 power factor(x=1) (ii) Half load, unity power factor (x=1/2) (iii)Three fourth load, 0.707 power factor (x=3/4)	**10**	**3**	**L3**
	b	Analyze the working principle of single-phase Transformer, and derive the expression for induced EMF in primary and secondary winding of a transformer.	**10**	**1**	**L4**
OR					
Q8	**a**	Define Slip. Calculate the Synchronous speed (Ns) and Speed (N) when Slip is 0.04 of a 3-phase Induction motor with 4-pole, supplied from an alternator having 6-poles and running at 1000 rpm.	**10**	**3**	**L3**
	b	Analyze how a rotating magnetic field is produced in the stator of a three-phase induction motor.	**10**	**1**	**L4**
Module – 5					
Q9	**a**	Explain earthing and illustrate Plate and Pipe earthing with neat sketches.	**10**	**2**	**L2**
	b	Define electric shock. Identify the safety precautions to be taken to avoid electric shock.	**10**	**2**	**L3**
OR					
Q10	**a**	With neat circuit diagram and switching table explain two way and three-way control of load.	**10**	**2**	**L2**
	b	Construct a neat block diagram and explain electric vehicles.	**10**	**2**	**L3**

SJC INSTITUTE OF TECHNOLOGY

(An Autonomous Institute under VTU, Belagavi)

FIRST/SECOND SEMESTER B.E DEGREE SUMMER SEMESTER END EXAMINATIONS

SEPTEMBER 2025

Course:	**INNOVATION AND DESIGN THINKING**		
Course Code:	**BIDT108/208**	**Stream: Common to all the branches**	
Max Marks:	**50**	**Duration:**	**1 Hour**

INSTRUCTIONS TO THE CANDIDATES

1. Use only **Black ball point pen** for writing/ darkening the circle
2. Answer all the **fifty** questions, each question carries one mark.
3. For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the **OMR** sheet.
4. Darkening two circles for the same question makes the answer invalid.

Q.NO.	Questions	Marks	CO	RBTL
1.	What is Design Thinking? a. A method facilitated by UX designers b. A process for creative problem solving c. A process to teach design to non-designers d. A methodology developed to discard old design methods	**1**	1	**L1**
2.	Collecting _____is an important portion of testing a prototype in the test stage of design thinking. a. Pictures b. Money c. Feedback d. Emails	**1**	1	**L1**
3.	Ideate means a. To rapidly change. b. When you create a 3D model of your design. c. The process for creating and sharing ideas where you use images and sketches instead of words to describe your idea. d. When you brainstorm ideas, get feedback, create an initial design, share the design, and iterate.	**1**	1	**L1**
4.	MVP stands for a. Minimum viable product b. Maximum viable product c. Most viable product d. None of above	**1**	1	**L1**
5.	The three "I"s of Design thinking DO NOT include a. Interest b. Implementation c. Inspiration d. Ideation	**1**	1	**L1**
6.	User persons are created during which phase of design process a. Design stage b. Discover stage c. Develop Stage d. None of the above	**1**	1	**L1**
7.	The ultimate goal of design thinking is to help you design better a. Services b. Products c. Experiences d. All of the above	**1**	1	**L1**
8.	Design thinking principles DO NOT include a. Feasibility b. Viability c. Desirability d. Credibility	**1**	1	**L1**
9.	Design thinking follows a. Waterfall Model b. Agile methodology c. Both of these d. None of these	**1**	1	**L1**

10.	User experienced design can be abbreviated as a. XD b. UXD c. UED d. All of these	**1**	1	**L1**
11.	Mind maps are used to _____ideas a. Generate b. Visualize c. Structure d. All of the above	**1**	1	**L1**
12.	Journey mapping is also called _____mapping a. Path b. Experience c. Conduct d. Feedback	**1**	1	**L1**
13.	Which of the following are NOT tools of Design Thinking? a. Co-creation b. Prototyping c. Mind Mapping d. Online Marketing	**1**	1	**L1**
14.	Which of these are NOT components of a mind map? a. Branches b. Arrows c. Central Idea d. All of the above	**1**	1	**L1**
15.	Journey mapping maps which phase of activity of service for a customer? a. Before a service b. During a service c. After a service d. All of the above	**1**	1	**L1**
16.	Drawing is one of the techniques related to mind mapping a. Agree b. Disagree	**1**	1	**L1**
17.	The four steps of canonical prototyping iteration are i. Developing a prototype to exemplify a possibility ii. Imaging possibilities iii. Receiving feedback on the prototype iv. Re-evaluating limitations. Choose the correct order of these steps a. i-ii-iii-iv b. ii-i-iii-iv c. ii-i-iv-iii d. iv-iii-ii-i	**1**	1	**L1**
18.	It is a close relative of visualization another way to make new ideas feel real and compelling a.Prototype b. Co-creation c. Learning launches d. Storytelling	**1**	1	**L1**
19.	A case study is a. a research strategy b. an empirical inquiry c. a descriptive and exploratory analysis d. All of the above			
20.	_____is used to represent how ideas or other items are linked to a central idea and to each other. a. Mind Mapping b. Experience Mapping c. Visualization d. Rapid Concept Development	**1**	1	**L1**
21.	What is the primary focus of Design Thinking in IT? a) Reducing IT infrastructure costs b) Creating user-centric solutions c) Maximizing system performance d) Automating all processes	**1**	2	**L1**
22.	Which phase of Design Thinking emphasizes understanding the problem from the user's perspective? a) Ideate b) Prototype c) Empathize d) Define	**1**	2	**L1**
23.	What is the purpose of the “Prototype” stage in Design Thinking? a) To finalize the solution b) To create testable models of ideas c) To gather user feedback d) To analyze the system requirements	**1**	2	**L1**
24.	4. Which of the following is NOT a principle of Design Thinking? a) Human-centered design b) Iterative process	**1**	2	**L1**

	c) Data security d) Collaboration			
25.	In the IT domain, Design Thinking is most effective when applied to: a) Server configuration optimization b) Cloud migration strategies c) Complex problem-solving and innovation d) Software license management	**1**	2	**L1**
26.	Which tool is commonly used in Design Thinking to visualize user journeys? a) ER diagrams b) User journey maps c) Data flow diagrams d) PERT charts	**1**	2	**L1**
27.	What role does empathy play in Design Thinking for IT solutions? a) Optimizes system speed b) Helps identify user needs and pain points c) Enhances database security d) Reduces software development costs	**1**	2	**L1**
28.	A primary goal of using Design Thinking in IT is to: a) Eliminate coding errors b) Enhance creativity in problem-solving c) Automate repetitive tasks d) Standardize programming languages	**1**	2	**L1**
29.	Which of these is a common tool or framework for Design Thinking? a) Six Sigma b) Kanban c) Double Diamond d) Lean Manufacturing	**1**	2	**L1**
30.	What is a key output of the Define phase in Design Thinking? a) Problem statement b) Final prototype c) Market analysis report d) Financial forecast	**1**	2	**L1**
31.	What is the primary goal of Design Thinking in strategic innovation? a) Maximizing revenue immediately b) Creating user-centered and innovative solutions c) Automating business processes d) Focusing solely on product quality	**1**	3	**L1**
32.	A company designing electric scooters incorporates real-time user feedback to improve battery performance. Which stage of Design Thinking does this represent? a) Prototype b) Test c) Ideate d) Define	**1**	3	**L1**
33.	Which of the following is NOT a characteristic of Design Thinking in strategy? a) Iterative problem-solving b) Human-centered approach c) Linear implementation process d) Focus on prototyping and feedback	**1**	3	**L1**
34.	4. A food delivery app identifies user pain points through surveys and focus groups. What stage of Design Thinking does this represent? a) Define b) Ideate c) Empathize d) Prototype	**1**	3	**L1**
35.	In strategic innovation, “thinking outside the box” often leads to: a) Process automation b) Incremental changes c) Radical new business models d) Reduced competition	**1**	3	**L1**
36.	What is the primary focus of strategic foresight in business? a) Predicting short-term trends b) Preparing for long-term uncertainties and opportunities c) Analyzing past sales data d) Automating processes	**1**	3	**L1**
37.	A retail company identifies future customer needs by analyzing current purchasing patterns and emerging market trends. This is an example of: a) Strategic foresight b) Competitive analysis c) Human resource planning d) Rapid prototyping	**1**	3	**L1**

38.	Which tool is most commonly used for strategic foresight? a) SWOT analysis b) Scenario planning c) Process automation d) Gantt charts	**1**	3	**L1**
39.	What does "change sense-making" involve? a) Minimizing employee feedback during transitions b) Understanding the impact of external and internal changes on strategy c) Creating rigid strategies d) Ignoring disruptive market trends	**1**	3	**L1**
40.	A telecom company uses workshops to involve employees in understanding new digital tools during organizational restructuring. What is this process called? a) Change sense-making b) Process standardization c) Extreme competition d) Rapid prototyping	**1**	3	**L1**
41.	What is the main purpose of a Design Thinking workshop? a) To conduct in-depth technical analysis of software b) To solve user-centric problems collaboratively c) To train employees in marketing strategies d) To analyze past business trends	**1**	4	**L1**
42.	Which of the following is NOT a stage in the Design Thinking process? a) Empathize b) Ideate c) Monetize d) Prototype	**1**	4	**L1**
43.	During a Design Thinking workshop, what is typically the first activity? a) Creating a prototype b) Building user personas c) Empathizing with users d) Testing a solution	**1**	4	**L1**
44.	What is the primary focus of the “Empathize” stage in Design Thinking? a) Designing a product based on assumptions b) Understanding user needs and pain points c) Developing technical solutions d) Gathering financial requirements	**1**	4	**L1**
45.	In a Design Thinking workshop, brainstorming solutions typically happens in which stage? a) Prototype b) Test c) Ideate d) Empathize	**1**	4	**L1**
46.	Which method is most commonly used during the Empathize stage? a) Surveys and interviews b) Software testing c) Budget analysis d) Revenue tracking	**1**	4	**L1**
47.	A company observes users interacting with their website to understand usability issues. This is an example of: a) Empathize b) Prototype c) Ideate d) Test	**1**	4	**L1**
48.	Empathy maps are useful for: a) Identifying competitors b) Visualizing user thoughts, feelings, and actions c) Developing test cases d) Conducting market analysis	**1**	4	**L1**
49.	A Design Thinking team spends a day shadowing healthcare workers to understand their challenges. What stage does this activity belong to? a) Ideate b) Empathize c) Test d) Prototype	**1**	4	**L1**
50.	In a Design Thinking workshop, why is the Empathize stage crucial? a) It sets budget expectations for the project. b) It ensures solutions are grounded in real user needs. c) It focuses solely on creating prototypes. d) It eliminates the need for testing.	**1**	4	**L1**

1	S	J	2	4					

SJC INSTITUTE OF TECHNOLOGY

(An Autonomous Institute under VTU, Belagavi)

FIRST/SECOND SEMESTER B.E DEGREE SUMMER SEMESTER END EXAMINATIONS

SEPTEMBER 2025

Course:	**INTRODUCTION TO PYTHON PROGRAMMING**		
Course Code:	**BPLC105 / 205**	**Branches: All Branches**	
Max Marks:	**100**	**Duration:**	**03 Hours**

Note:

1. Answer any FIVE full questions, choosing one full Question from each Module.
2. Any missing Data can be suitably assumed.

Q. No.		Module - 1	Marks	CO	RBTL
Q1	a	List math operators with its precedence rule used in python.	6	1	L1
	b	Illustrate the syntax and control flow diagrams of if, elif and else statements in python with example for each.	8	1	L2
	c	Develop a python program to check whether the number is even or not.	6	1	L3
		OR			
Q2	a	Define the following built in functions with suitable examples. i) print() ii) input() iii) len()	6	1	L1
	b	Illustrate while and for looping control statements in Python with a syntax and example to each.	8	1	L2
	c	Develop a python program to find the area of square and circle.	6	1	L3
		Module – 2			
Q3	a	Define List with suitable examples.	6	2	L1
	b	Explain List Concatenation and List Replication with examples for each.	8	2	L2
	c	Develop a program that counts the number of occurrences of each letter in a string.	6	2	L3
		OR			
Q4	a	Define local and global scope with suitable examples.	6	2	L1
	b	Summarize with a programming example to each w.r.t lists and dictionaries: i) get() ii) setdefault() iii)keys() iv)values()	8	2	L2
	c	Develop a program to calculate and print mean and variance.	6	2	L3

Module – 3					
Q5	**a**	Show how in and not in operations are used in strings with an example.	**6**	**3**	**L1**
	b	Explain file Reading and Writing process with suitable example.	**8**	**3**	**L2**
	c	Develop a python code to determine whether the given string is a palindrome or not a palindrome.	**6**	**3**	**L3**
OR					
Q6	**a**	Define string indexing and slicing with examples.	**6**	**3**	**L1**
	b	Explain shelve module with an example.	**8**	**3**	**L2**
	c	Develop a Python program to swap cases of a given string. Input: Java Output: jAVA	**6**	**3**	**L3**
Module – 4					
Q7	**a**	What is class? How to define class in python?	**4**	**4**	**L1**
	b	Explain pure function and modifier function.	**8**	**4**	**L2**
	c	Analyze and build a python program that uses class Student which prompts the user to enter marks in three subjects and calculates total marks, percentage and displays the score card details.	**6**	**4**	**L4**
OR					
Q8	**a**	What is operator overloading. Mention any two operators with respective special functions to be overloaded in python.	**6**	**4**	**L1**
	b	Explain Prototyping v/s Planning.	**8**	**4**	**L2**
	c	Analyze and build a python program that repeatedly asks user for their age and a password until they provide valid input. [age is in digit and password in alphabet and digit only].	**6**	**4**	**L4**
Module – 5					
Q9	**a**	What is the ndarray in NumPy and how it is considered the heart of the library?	**6**	**5**	**L1**
	b	Explain the architecture of Matplotlib, highlighting the roles of the Backend Layer, Artist Layer, and Scripting Layer.	**8**	**5**	**L2**
	c	Analyze and build a Python code to create a line chart using matplotlib. pyplot. include the following customizations: (i) Add a title and axis labels. (ii) Add a grid.	**6**	**5**	**L4**
OR					
Q10	**a**	List the main data structures in the pandas library?	**6**	**5**	**L1**
	b	Explain how conditions are applied to create Boolean arrays are used in NumPy.	**8**	**5**	**L2**
	c	Analyze and build a Python program to Demonstrate how to Draw a Scatter Plot using Matplotlib.	**6**	**5**	**L4**

1	S	J	2	4					

SJC INSTITUTE OF TECHNOLOGY

(An Autonomous Institute under VTU, Belagavi)

FIRST/SECOND SEMESTER B.E DEGREE SUMMER SEMESTER END EXAMINATIONS

SEPTEMBER 2025

Course:	**COMPUTER-AIDED ENGINEERING DRAWING**		
Course Code:	**BCED103/203**	**Branches: Common to all Branches**	
Max Marks:	**100**	**Duration:**	**03 Hours**

Note: 1. Answer ONE full question from each Part A, Part B and Part C.

2. Any missing Data can be suitably assumed.

Q. No.		**PART – A: Sketching**	**Marks**	**CO**	**RBTL**
Q1	**a**	The point "K" is 50mm in front of VP and is situated in 4th quadrant. Its shortest distance from the intersection of HP & VP is 55mm. Draw the projections. Also find its distance from HP.	**10**	**1**	**L2**
	b	The top view PQ of a straight line is 70mm and makes an angle of 60° with XY line the end Q is 10mm In front of VP 30mm above HP the difference between the distance of P and Q above HP is 45mm. Draw the projections and determine the true length and true inclination with HP and VP.	**15**	**1**	**L3**
	c	A regular hexagonal lamina of side 25 mm is lying in such a way that one of its corners on HP while the corner opposite to the corner on which it rests on VP. If the lamina makes 60 deg. To HP. Draw the projections of the lamina.	**20**	**2**	**L3**
OR					
Q2	**a**	A point "F" is 35mm below HP, 40mm in front of VP and 25mm from LPP. State the quadrant in which it lies and draw its Projection.	**10**	**1**	**L2**
	b	The top view of a line 75mm long measures 50mm the end P is 30mm in front of VP and 15mm above HP. The end Q is 15mm in front of VP and above HP. Draw the projection and find its true inclinations with HP and VP.	**15**	**1**	**L3**
	c	An equilateral triangular lamina of 25 mm sides lies with one of its edges on HP such that the surface of the lamina is inclined to HP at 60 deg. The edge on which it rests is inclined to VP at 60 deg. Draw its projections.	**20**	**2**	**L3**
PART – B: Computer Aided Drafting					
Q3		A hexagonal prism 25mm sides of base and 50mm axis length rests on HP on one of its edges of the base. Draw the projections of the prism when the axis is inclined to HP at 45° & VP at 30°.	**30**	**3**	**L3**

	OR			
Q4	A square pyramid 35mm sides of base & 60mm axis length rests on HP on one of its slant edges. Draw the projections of the pyramid when the axis appears to be inclined to VP at 45°.	**30**	**3**	**L3**
	PART – C: Computer Aided Drafting			
Q5	A sphere of diameter 50mm rests centrally on top of a cube of sides 50mm. Draw the isometric projections of the combination of the solids.	**25**	**4**	**L3**
	OR			
Q6	A rectangular prism of base 40 mm x 25 mm and 65 mm rests on HP on its base with the longer base side inclined at 30^0 to VP. It is cut by a plane inclined at 40^0 to HP, perpendicular to VP cuts the axis as its mid height. Draw the development of the lower portion of the prism.	**25**	**4**	**L3**