



SJC INSTITUTE OF TECHNOLOGY

(An Autonomous Institute under VTU, Belagavi)

SECOND SEMESTER B.E DEGREE SEMESTER END EXAMINATIONS

JUNE - JULY 2026

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Course:	MATHEMATICS-II FOR CV STREAM		
Course Code:	BMATC201	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. Use of Formula Handbook is Permitted.

Q. No.						MODULE - 1	Marks	CO	RBTL
Q1	a	Evaluate $\int_0^a \int_0^x \int_0^{x+y} e^{x+y+z} dz dy dx$	6	1	L2				
	b	Derive the relation between Beta and Gamma function of $\beta(m, n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$.	7	1	L2				
	c	Prove that $\int_0^{\frac{\pi}{2}} \sqrt{\sin \theta} d\theta \cdot \int_0^{\frac{\pi}{2}} \frac{1}{\sqrt{\sin \theta}} d\theta = \pi$.	7	1	L3				
OR									
Q2	a	Evaluate $\int_{-1}^1 \int_0^z \int_{x-z}^{x+z} (x + y + z) dx dy dz$.	6	1	L2				
	b	By changing the order of integration, evaluate $\int_0^1 \int_x^{\sqrt{x}} xy dy dx$.	7	1	L2				
	c	Prove that $\Gamma\left(\frac{1}{2}\right) = \sqrt{\pi}$.	7	1	L3				
MODULE - 2									
Q3	a	Define an irrotational vector. Find the constants a, b and c such that $A^{\rightarrow} = (axy - z^3)i + (bx^2 + z)j + (bxz^2 + cy)k$ is irrotational..	6	2	L2				
	b	Find the directional derivative of $\phi = x^2yz + 4xz^2$ at the point $(1, -2, -1)$ in the direction of the vector $2\hat{i} - \hat{j} - 2\hat{k}$.	7	2	L2				
	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 $y = x^2$.	7	2	L3				
OR									
Q4	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	L1				
	b	If $F^{\rightarrow} = \nabla(xy^3z^2)$ find $div F^{\rightarrow}$ and $curl F^{\rightarrow}$ at the point $(1, -1, 1)$.	7	2	L3				
	c	Apply Stoke's theorem to evaluate $\int F^{\rightarrow} \cdot dr^{\rightarrow}$ where $F^{\rightarrow} = y2\hat{i} + x2\hat{j} - (x + z)\hat{k}$ and C is the boundary of the triangle with the vertices $(0, 0, 0), (1, 0, 0), (1, 1, 0)$.	7	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	L1				
	b	Form the PDE by eliminating the arbitrary function from $f(x + y + z, x^2 + y^2 + z^2) = 0$,	7	2	L2				

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	c	Solve $\frac{\partial^2 z}{\partial x \partial y} = \sin x \sin y$ for which $\frac{\partial z}{\partial y} = -2 \sin y$ when $x=0$ and $z=0$ when y is an odd multiple of $\frac{\pi}{2}$	7	2	L3											
OR																
Q6	a	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.	6	2	L1											
	b	Solve $\frac{\partial^2 z}{\partial x^2} = a^2 z$ given that $x=0$, $z=0$ and $\frac{\partial z}{\partial x} = a \sin y$.	7	2	L3											
	c	With usual notations derive a one-dimensional wave equation.	7	5	L3											
MODULE - 4																
Q7	a	Find an approximate real root of the equation $x^3 - 3x + 4 = 0$ using the method of false position, correct to three decimal places which lie between -3 and -2. Carry out three iterations.	6	3	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 formula.	7	3	L2											
	c	Evaluate $\int_0^6 x \frac{dx}{1+x^2}$ using Simpsons 3/8th rules by taking 6 equal parts.	7	3	L3											
OR																
Q8	a	Find the real root of the equation $\cos x = xe^x$, which is nearer to $x = 0.5$ by the Newton-Raphson method, correct to four decimal places.	6	3	L2											
	b	Use Simpson's 1/3rd rule to find $\int_4^{5.2} \log x \, dx$ by taking 7 ordinates.	7	3	L2											
	c	Determine $f(9)$ by using the Newton's divided difference formula <table border="1"> <tr> <td>x</td><td>5</td><td>7</td><td>11</td><td>13</td><td>17</td></tr> <tr> <td>$f(x)$</td><td>150</td><td>392</td><td>1452</td><td>2366</td><td>5202</td></tr> </table>	x	5	7	11	13	17	$f(x)$	150	392	1452	2366	5202	7	3
x	5	7	11	13	17											
$f(x)$	150	392	1452	2366	5202											
MODULE - 5																
Q9	a	Employ Taylor's series method to obtain approximate value of y at $x=0.2$ for $\frac{dy}{dx} = 2y + 3e^x$.	6	4	L2											
	b	Using modified Euler's formula, compute $y(1.1)$ correct to three decimal places given that $\frac{dy}{dx} + \frac{y}{x} = \frac{1}{x^2}$ and $y = 1$ at $x = 1$.	7	4	L3											
	c	Using Modern Mathematical tools, write the code to find the solution of $y' = -ky$ with $y(0) = 100$ using modified Euler's method at $x = 100$ by $h = 25$.	7	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 the Runge-Kutta method of fourth order solve $\frac{dy}{dx} = \frac{y^2-x^2}{y^2+x^2}$ with $y(0)=1$ at $x=0.2$.	7	4	L3											
	c	Write a modern mathematical tool program to solve $\frac{dy}{dx} = 2x + y$, $y(1) = 2$ by the Runge-Kutta 4 th order method.	7	5	L5											



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JUNE - JULY 2026

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Course:	MATHEMATICS-II FOR EC STREAM		
Course Code:	BMATE201	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. Use of Formula Handbook is Permitted.

Q. No.						MODULE - 1		Marks	CO	RBTL
Q1	a	Find the angle between the surfaces $x^2 + y^2 + z^2 = 9$ and $z = x^2 + y^2 - 3$ 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 $Curl\vec{F}$.					7	1	L3	
	c	Evaluate using stoke's theorem given $\vec{F} = (x^2 + y^2)\hat{i} - 2xy\hat{j}$ taken around rectangle bounded by $x = 0$, $x = a$, $y = 0$, $y = b$.					7	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 $\vec{F} = \nabla\phi$.					7	1	L3	
	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.					7	1	L3	
MODULE - 2										
Q3	a	Show that the set of vectors $S = \{(1, 3, 2), (1, -7, -8), (2, 1, -1)\}$ are Linearly Dependent.					6	2	L2	
	b	Verify the Rank-Nullity theorem for the linear transformation $T: V_3(\mathbb{R}) \rightarrow V_2(\mathbb{R})$ defined by $T(x, y, z) = (y - x, y - z)$.					7	2	L3	
	c	Show that the functions $f(x) = 3x - 2$ and $g(x) = x$ are orthogonal in P_n with inner product $\langle f, g \rangle = \int_0^1 f(x)g(x)dx$.					7	2	L3	
OR										
Q4	a	Analyse the matrix of the linear transformation $T: V_2(\mathbb{R}) \rightarrow V_3(\mathbb{R})$ 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 $\{(2, 4, 2), (1, -1, 0), (1, 2, 1), (0, 3, 1)\}$ in $V_3(\mathbb{R})$.					7	2	L3	

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	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 .	7	2	L3										
MODULE – 3															
Q5	a	Find the Laplace transform of $F(t) = \cos t \cos 2t \cos 3t$.	6	3	L2										
	b	Find the Laplace transform of the function $f(x) = \begin{cases} E & 0 < t < \frac{a}{2} \\ -E & \frac{a}{2} < t < a \end{cases}$ Where $f(t + a) = f(t)$. Prove that $L(f(t)) = \frac{E}{s} \tanh\left(\frac{as}{4}\right).$	7	3	L3										
	c	Analyze the given differential equation $y'' + 4y' + 4y = e^{-t}$ with initial conditions $y(0) = y'(0) = 0$, by transforming it using Laplace transform.	7	3	L4										
OR															
Q6	a	Find the Laplace Transform of $\frac{\cos at - \cos bt}{t}$	6	3	L2										
	b	Express $f(t) = \begin{cases} \cos t & 0 < t < \pi \\ \cos 2t & \pi < t < 2\pi \\ \cos 3t & t > 2\pi \end{cases}$ in terms of unit step function & hence find $L[f(t)]$	7	3	L3										
	c	Analyze the given Laplace transform $\frac{1}{s(s+1)(s+2)(s+3)}$ by identifying appropriate algebraic manipulations and transformations needed to determine its inverse Laplace form in the time domain.	7	3	L4										
MODULE – 4															
Q7	a	Compute real root of $x \log_{10} x = 1.2$ using Regular falsi method lies between (2.7, 2.8) Correct to three decimal places of accuracy.	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.	7	4	L3										
	c	Evaluate $\int_0^{\frac{\pi}{2}} \sqrt{\cos \theta} d\theta$ by using Simpsons $(3/8)^{th}$ rule by taking 7 ordinates.	7	4	L3										
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	Use Lagrange's interpolation formula to find the polynomial for the data <table><tr><td>x</td><td>0</td><td>1</td><td>3</td><td>4</td></tr><tr><td>y</td><td>-12</td><td>0</td><td>6</td><td>12</td></tr></table> Hence find y at $x = 2$.	x	0	1	3	4	y	-12	0	6	12	7	3	L3
	x	0	1	3	4										
y	-12	0	6	12											
c	Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Simpsons $(1/3)^{rd}$ rule by taking 4 equal parts.	7	3	L3											
MODULE – 5															
Q9	a	Employ Taylor's series method to obtain approximate value of y at $x = 0.1$ for $\frac{dy}{dx} = 2y + 3e^x$, $y(0) = 0$.	6	4	L2										
	b	Applying Milne's Predictor – Corrector method, to find $y(1.4)$ given that $\frac{dy}{dx} = x^2 + \frac{y}{2}$, given that $y(1) = 2$, $y(1.1) = 2.2156$, $y(1.2) = 2.4649$, $y(1.3) = 2.7514$.	7	4	L3										

2024 SCHEME

	c	Using modern mathematical tools, write the code to find the solution of $\frac{dy}{dx} = 1 + \frac{y}{x}$ at $x=2$ taking $h = 0.2$. Given that $y(1) = 2$ by Runge-Kutta 4 th order method.	7	5	L5
OR					
Q10	a	Solve by Runge-Kutta method to find approximate value of y when $x=0.2$ given that $y(0) = 1$ and function is $\frac{dy}{dx} = \frac{y-x}{y+x}$.	6	4	L2
	b	Applying Milne's Predictor – Corrector method, to find $y(0.8)$ given that $\frac{dy}{dx} = x - y^2$, $y(0) = 0$, $y(0.2) = 0.02$, $y(0.4) = 0.0795$, $y(0.6) = 0.1762$.	7	4	L3
	c	Using modern mathematical tools, write the code to find the solution of $y' = -ky$ with $y(0) = 100$ using modified Euler's method at $x = 100$, by taking $h = 25$.	7	5	L5





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SECOND SEMESTER B.E DEGREE SEMESTER END EXAMINATIONS

JUNE - JULY 2026

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Course:	MATHEMATICS-II FOR ME STREAM		
Course Code:	BMATM201	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. Use of Formula Handbook is Permitted.

Q. No.		MODULE - 1	Marks	CO	RBTL
Q1	a	Obtain the Maclaurin's series of $\log(1+x)$ up to 3 rd degree term.	6	1	L2
	b	If $u = f(x-y, y-z, z-x)$ prove that $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$.	7	1	L2
	c	If $u = x^2 + y^2 + z^2, v = xy + yz + zx, w = x + y + z$ find $\partial \left(\frac{u,v,w}{x,y,z} \right)$.	7	1	L3
OR					
Q2	a	Obtain the Maclaurin's series of $\sqrt{1 + \sin 2x}$	6	1	L2
	b	If $u = x + 3y^2 - z^3, v = 4x^2yz, w = 2z^2 - xy$ evaluate $\frac{\partial(u,v,w)}{\partial(x,y,z)}$ at the point (1,-1, 0)	7	1	L3
	c	Find the extreme values of $f(x,y) = x^4 + y^4 - 2(x-y)^2$.	7	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	Show that $\vec{F} = (y+z)\hat{i} + (z+x)\hat{j} + (x+y)\hat{k}$ is irrotational. Also find a scalar function ϕ , such that $\vec{F} = \nabla\phi$.	7	2	L2
	c	Apply Stoke's theorem to evaluate $\oint \vec{F} \cdot d\vec{r}$ where $\vec{F} = y\hat{i} + z\hat{j} + x\hat{k}$ and S is the upper half of the sphere $x^2 + y^2 + z^2 = 1$ and C is its boundary.	7	2	L4
OR					
Q4	a	If $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$ show that i) $\nabla \cdot \vec{r} = 3$ (ii) $\nabla \times \vec{r} = \vec{0}$ (iii) $\nabla r^n = nr^{n-2}\vec{r}$	6	2	L3
	b	Evaluate $\int (5xy - 6x^2)dx + (2y - 4x)dy$, over the curve $y = x^3$ in the xy -plane from the point (1,1) to (2,8)	7	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 $y = x^2$.	7	2	L4
MODULE - 3					
Q5	a	Form the partial differential equation by eliminating the arbitrary function from $lx + my + nz = f(x^2 + y^2 + z^2)$	6	3	L1
	b	Solve $x(y^2 - z^2)p + y(z^2 - x^2)q - z(x^2 - y^2)r = 0$	7	3	L2

2024 SCHEME

	c	With usual notations derive a one-dimensional wave equation	7	3	L3												
OR																	
Q6	a	Form the partial differential equation by eliminating constant a, b and c from $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$.	6	3	L1												
	b	Solve $\frac{\partial^2 z}{\partial y^2} = z$, given that $y = 0, z = e^x$ and $\frac{\partial z}{\partial y} = e^{-x}$	7	3	L3												
	c	With usual notation derive heat equation.	7	3	L3												
MODULE – 4																	
Q7	a	Find the number of students whose marks in between 40 and 45 using Newton's forward interpolation formula for the data. <table border="1"><tr><td>Marks</td><td>30-40</td><td>40-50</td><td>50-60</td><td>60-70</td><td>70-80</td></tr><tr><td>No. of students</td><td>31</td><td>42</td><td>51</td><td>35</td><td>31</td></tr></table>	Marks	30-40	40-50	50-60	60-70	70-80	No. of students	31	42	51	35	31	6	4	L2
	Marks	30-40	40-50	50-60	60-70	70-80											
	No. of students	31	42	51	35	31											
b	Using Lagrange's interpolation formula, fit a polynomial which passes through the points (0, -12), (1, 0), (3, 6) and (4,12) and hence estimate the value of y when $x = 2$	7	4	L2													
c	Evaluate $\int_4^{5.2} \log x \, dx$ using Trapezoidal rule by taking 7 ordinates.	7	4	L3													
OR																	
Q8	a	Find an approximate value of the root of the equation $xe^x=3$, using the method of false position, carry out four iterations.	6	4	L2												
	b	Using Newton-Raphson method find a real root of the equation $3x = \cos x + 1$. Take $x_0=1$ and perform 3 iterations	6	4	L2												
	c	Evaluate $\int_0^1 \frac{dx}{1+x^2}$ by using Simpson's $1/3^{\text{rd}}$ rule taking four equal strips and hence deduce an approximate value of π .	8	4	L3												
MODULE – 5																	
Q9	a	Solve the differential equation $\frac{dy}{dx} = x^2 + y^2$ given $y(0) = 1$ to find the value of $y(0.1)$ by using the Taylor's series method taking the terms up to 4 th order .	6	4	L2												
	b	Using Runge - Kutta method of order 4, find y at $x = 0.1$, given that $\frac{dy}{dx} = 3e^x + 2y, y(0) = 0$ and $h = 0.1$.	7	4	L3												
	c	Using modern mathematical tools, write the code to find the solution $y' + 4y = x^2$, where $y(0) = 1$, with using Taylor series method at $x=0.1$.	7	5	L5												
OR																	
Q10	a	Find the value of $y(0.1)$ using the Runge- Kutta method of fourth order, for the given equation $y' = 3x + \frac{y}{2}; y(0) = 1$.	6	4	L2												
	b	Apply Milne's Predictor-Corrector method, find $y(0.8)$, from $\frac{dy}{dx} = x - y^2$, given that $y(0)=0, y(0.2)=0.02, y(0.4)=0.0795, y(0.6)=0.1762$	7	4	L3												
	c	Write a modern mathematical tool program to solve $\frac{dy}{dx} = 1 + \frac{y}{x}$ at $y(2)$ taking $h = 0.2$ given that $y(1) = 2$ by the Runge-Kutta 4th order method.	7	5	L5												

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SECOND SEMESTER B.E DEGREE SEMESTER END EXAMINATIONS

JUNE-JULY 2026

Course:	MATHEMATICS-II FOR CSE STREAM		
Course Code:	BMATS201	Branches: CSE, ISE, AIML, CSD and 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. Use of Formula Handbook is Permitted.

Q. No.		MODULE - 1	Marks	CO	RBTL
Q1	a	Find the angle between the surfaces $x^2 + y^2 + z^2 = 9$ and $x^2 + y^2 - 3 = z$ at the point $(2, -1, 2)$	6	1	L2
	b	If $\vec{F} = (x + y + 1)i + j - (x + y)k$, show that $\vec{F} \cdot \text{curl } \vec{F} = 0$.	7	1	L3
	c	Show that the cylindrical coordinate system is orthogonal.	7	1	L3
OR					
Q2	a	If $\vec{F} = \nabla(xy^3z^2)$, find $\text{div}\vec{F}$ and $\text{Curl}\vec{F}$ at the point $(1, -1, 1)$.	6	1	L2
	b	Find the directional derivative of $\phi = xy^3 + yz^3$ at $(2, -1, 1)$ in the direction of the vector $\hat{i} + 2\hat{j} + 2\hat{k}$.	7	1	L2
	c	Show that cylindrical coordinate system is orthogonal.	7	1	L3
MODULE - 2					
Q3	a	Show that the set $S = \{(1, 2, 4), (1, 0, 0), (0, 1, 0), (0, 0, 1)\}$ is linearly dependent.	6	2	L2
	b	Verify the Rank-nullity theorem for the linear transformation $T: V_3(R) \rightarrow V_3(R)$ defined by $T(x, y, z) = (x + 2y - z, y + z, x + y + 2z)$.	7	2	L3
	c	Show that the functions $f(x) = 3x - 2$ and $g(x) = x$ are orthogonal in P_n with inner product $\langle f, g \rangle = \int_0^1 f(x)g(x)dx$.	7	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	Analyze the matrix of the linear transformation $T: V_2(R) \rightarrow V_3(R)$ such that $T(-1, 1) = (-1, 0, 2)$ and $T(2, 1) = (1, 2, 1)$.	7	2	L4
	c	Determine the inner product for the functions $f(t) = 4t+3$ and $g(t) = t^2$ and also find norm of f and g .	7	2	L4
MODULE - 3					
Q5	a	i) Find the remainder when 2^{23} is divided by 47. ii) Find the last digit in 7^{118} .	6	3	L1

2024 SCHEME

	b	Encrypt the message STOP using RSA with key (2537, 13) using the prime numbers 43 and 59.	7	3	L3									
	c	Using Fermat's Little Theorem, show that $8^{30} - 1$ is divisible by 31.	7	3	L4									
OR														
Q6	a	Find the least positive values of x such that i) $71 \equiv x \pmod{8}$ ii) $78+x \equiv 3 \pmod{5}$.	6	3	L1									
	b	Solve the system of linear congruence $x \equiv 3 \pmod{5}$, $y \equiv 2 \pmod{6}$, $z \equiv 4 \pmod{7}$ using Remainder Theorem.	7	3	L3									
	c	Find the last digit of (i) 7^{2013} (ii) 13^{37} .	7	3	L4									
MODULE - 4														
Q7	a	Find an approximate real root of the equation $\cos x = 3x - 1$ using False position method.	6	4	L2									
	b	Given, $\sin 45^\circ = 0.7071$, $\sin 50^\circ = 0.7660$, $\sin 55^\circ = 0.8192$, $\sin 60^\circ = 0.8660$, find $\sin 57^\circ$ using appropriate interpolation formula.	7	4	L3									
	c	Evaluate $\int_0^{\frac{\pi}{2}} \sqrt{\cos \theta} d\theta$ by using Simpsons $3/8^{\text{th}}$ rule by taking 7 ordinates.	7	4	L4									
OR														
Q8	a	Use Newton-Raphson method to find real root of equation $x \log_e x = 1.2$ near 2.3. Carry out three iterations.	6	4	L2									
	b	Evaluate $\int_0^5 \frac{dx}{4x+5}$ by Simpson's $(1/3)^{\text{rd}}$ rule, dividing the interval into 10 equal parts.	7	4	L3									
	c	Use Lagrange's interpolation formula, find y at x = 2 <table><tr><td>x</td><td>0</td><td>1</td><td>3</td><td>4</td></tr><tr><td>y</td><td>-12</td><td>0</td><td>6</td><td>12</td></tr></table>	x	0	1	3	4	y	-12	0	6	12	7	4
x	0	1	3	4										
y	-12	0	6	12										
MODULE - 5														
Q9	a	Employ Taylors series method to obtain approximate value of y at $x = 0.2$ for $\frac{dy}{dx} = 2y + 3e^x$, $y(0) = 0$.	6	4	L2									
	b	Using the Runge - Kutta method of order four, find y at $x = 0.2$ given that $\frac{dy}{dx} = x + y$, $y = 1$ when $x = 0$.	7	4	L3									
	c	Write a program to find the solution of ODE of first order $\frac{dy}{dx} = -2y + x^3 e^{-2x}$; by using Modified Euler's method.	7	5	L5									
OR														
Q10	a	Employ Taylors series method to obtain approximate value of y at $x = 0.2$ for the given $\frac{dy}{dx} = x^2 y - 1$, $y(0) = 1$. Find y for 5 decimal places of accuracy.	6	4	L2									
	b	Using modified Euler's method find $y(0.1)$, given $\frac{dy}{dx} = x^2 - y$; $y(0) = 1$, Perform two iterations at each step, taking $h = 0.05$.	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									

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JUNE - JULY 2026

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.

Page 1 of 2

2024 SCHEME

MODULE – 3

Q5	a	What are the properties of Laser? Explain population inversion and metastable state.	6	2	L1
	b	Explain types of optical fibers with neat diagrams.	8	2	L2
	c	Calculate the attenuation coefficient for a fiber of length 200 m given the input and output optical power of the fiber 90 mW and 60 mW.	6	2	L3

OR

Q6	a	Derive an expression for NA in terms of RI of core and cladding.	6	2	L1
	b	Describe the construction and working of semiconductor laser with neat diagrams.	8	2	L2
	c	A laser operating at 632.8 nm emits 3.182×10^{16} photons per second. Calculate the output power of the laser if the input power is 100 watt. Also find the percentage power converted into coherent light energy.	6	2	L3

MODULE – 4

Q7	a	Explain the types of nanomaterials.	4	3	L1
	b	Describe the principle, construction and working of X-Ray diffractometer.	10	3	L2
	c	The spacing between the planes in a crystal of NaCl is 2.82 Å. It is found that the first order Bragg's reflection occurs at 10° . i) What is the wavelength of the X-rays? ii) At what angle, the second order reflection occurs?	6	3	L3

OR

Q8	a	Define nanomaterials and nanocomposites. Write two applications of nanomaterials.	4	3	L1
	b	Describe the construction, principle and working of scanning electron microscope (SEM).	10	3	L2
	c	Determine the crystallite size given the Wavelength of X-rays 10nm, the Peak Width 0.5° and peak position 25° for a cubic crystal given $K = 0.94$.	6	3	L3

MODULE – 5

Q9	a	What are Hazards? Explain types of Hazards.	4	4	L1
	b	What are Tsunami waves? Enumerate the causes and adverse effects of Tsunami waves.	10	4	L2
	c	In an optical fiber experiment, the laser light propagating through an optical fiber cable made a spot diameter of 8 mm on the screen. The distance between the end of the cable and the screen is 0.031 m. Calculate the angle of acceptance and NA of the fiber.	6	5	L4

OR

Q10	a	What are the fire safety rules?	4	4	L1
	b	What is a Landslide? Enumerate the causes and adverse effects of Landslides.	10	4	L2
	c	In a diffraction grating experiment, the laser light undergoes second order diffraction for diffraction angle 1.48° . The grating constant is $50\mu\text{m}$. Calculate the wavelength of the Laser light.	6	5	L4

2024 SCHEME

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SJC INSTITUTE OF TECHNOLOGY
(An Autonomous Institute under VTU, Belagavi)
FIRST/SECOND SEMESTER B.E DEGREE SEMESTER END EXAMINATIONS
JUNE - JULY 2026

Course:	APPLIED PHYSICS FOR ECE STREAM			
Course Code:	BPHYE102/202	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	Define attenuation in fiber with the expression for attenuation coefficient and mention the various types of fiber losses.	4	1	L1
	b	Describe the principle, construction and working of CO ₂ laser with suitable diagrams.	10	1	L2
	c	Compare the acceptance angle of an optical fiber placed in air and water given the RI of water 1.33 and the RI of core and cladding is 1.5 and 1.45 respectively and calculate V-number and number of modes of the fiber with core diameter 120μm and wavelength of source is 689nm.	6	1	L3
OR					
Q2	a	Define the following: i)Induced absorption ii) Spontaneous emission iii) Stimulated emission iv) Metastable state.	4	1	L1
	b	Explain modes of propogation in optical fiber and classify different types of optical fiber based on Refractive Index profile.	10	1	L2
	c	Calculate the ratio of population of the two energy states of a medium in thermal equilibrium. The transition between this states results in the emission of photons of wavelength 694.3 nm. Assume the ambient temperature as 27°C.	6	1	L3
MODULE – 2					
Q3	a	Define matter waves and de-Broglie hypothesis.	4	2	L1
	b	State Heisenberg’s uncertainty principle and show that electron does not exist within the nucleus of an atom.	8	2	L3
	c	Define wave function and derive an expression for one dimensional time independent Schrodinger’s wave equation.	8	2	L3
OR					
Q4	a	Define probabity density and normalization of the wave function.	4	2	L1
	b	Solve Schrodinger wave equation to find the eigen values and eigen functions for a particle in one dimension potential well of infinite height	8	2	L3

2024 SCHEME

	c	Compare the energy of a photon with that of an electron when both are associated with a wave length, case i) 0.2 nm, case ii) 682 nm	8	2	L3
MODULE – 3					
Q5	a	Define the following i) dielectric material. ii) dipole moment. iii) polarization. iv) dielectric constant of a material.	4	3	L1
	b	Explain the assumptions and merits of quantum free electron theory.	10	3	L2
	c	Calculate the probability of an electron occupying an energy level 0.02eV above the fermi level at 200K and 400K in a material.	6	3	L3
OR					
Q6	a	Define the following i) Fermi Energy. ii) Fermi Factor. iii) Fermi Velocity. iv) Fermi Temperature.	4	3	L1
	b	Describe in brief the various types of polarization mechanisms in dielectric materials and the frequency dependence of dielectric constant.	10	3	L2
	c	Calculate the fermi velocity and mean free path for the conduction electrons in silver, given that its fermi energy is 5.5eV, and the relaxation time for electrons is 3.83×10^{-14} s.	6	3	L3
MODULE – 4					
Q7	a	What is Hall effect? Write the expression for Hall coefficient, Hall voltage and, Hall mobility.	4	3	L1
	b	Explain the principle, construction and working of semiconductor laser.	8	3	L2
	c	Define law of mass action and derive the expression for electrical conductivity for a semiconductor.	8	3	L3
OR					
Q8	a	Define fermi level in a semiconductor and draw a neat energy band diagram of intrinsic and extrinsic semiconductor with fermi level.	4	3	L1
	b	Explain the principle, construction and working of Photo-diode.	8	3	L2
	c	Define Hall effect with neat diagram and, Obtain the expression for the Hall voltage and Hall coefficient.	8	3	L3
MODULE – 5					
Q9	a	Write a note on BCS theory of superconductivity.	4	4	L1
	b	Discuss Langevin's theory of diamagnetism and effect of temperature on a ferromagnetic material based on curie-weiss law.	10	4	L2
	c	Design an experiment to verify the Meissner effect in a superconducting material.	6	4	L4
OR					
Q10	a	What are hard and soft magnetic materials? Mention two applications for each.	4	4	L1
	b	Explain the Temperature dependence of resistivity of a superconductor. Categorize the types of Superconductors using M-H graphs.	10	4	L2
	c	Design an experiment to determine the remanent induction and coercive field of a ferromagnetic material using a B-H curve.	6	4	L4

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JUNE - JULY 2026

Course:	APPLIED PHYSICS FOR ME STREAM		
Course Code:	BPHYM102/202	Branch: ME, AE & AS	
Max Marks:	100	Duration:	03 Hours

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.

Page 1 of 2

2024 SCHEME**MODULE – 3**

Q5	a	State Braggs law and mention the significance of Bragg's law in crystallography.	6	3	L1
	b	Describe the Principle, Construction and working of X-ray Photoelectron Spectroscopy and mention its advantages and applications.	8	3	L3
	c	Determine the crystal size, given that the wavelength of X-rays 10nm, the peak width 0.5° and peak position 25° for a cubic crystal given $K = 0.94$.	6	3	L3

OR

Q6	a	Define Nano material and nano composite and mention different types of Nano materials based on the dimensional constraints.	6	3	L1
	b	Explain the construction and working of Scanning Electron Microscope with the help of neat diagram.	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 interplanar spacing of the crystal is 2.82° .	6	3	L3

MODULE – 4

Q7	a	Define Simple Harmonic motion and mention its characteristic properties of SHM.	6	2	L1
	b	Describe the construction and working of Reddy's Shock tube with the help of neat diagram.	8	2	L2
	c	A free particle is executing simple harmonic motion in a straight line with a period of 25 seconds, 5 seconds after it has crossed the equilibrium point, the velocity is found to be 0.7m/s. calculate the displacement at the end of 10 seconds, and also the amplitude of oscillation.	6	2	L3

OR

Q8	a	What are shock waves? Mention any Two characteristics properties and Two applications of shock waves	6	2	L1
	b	Explain force constant and derive the expressions for equivalent force constant for Springs in series and Parallel.	8	2	L2
	c	The distance between the two pressure sensors in a shock tube is 150mm. the time taken by a shock wave to travel the distance is 0.3ms. If the velocity of sound under the same condition is 340 m/s. Find the Mach number of the shock wave.	6	2	L3

MODULE – 5

Q9	a	Define See-beck effect, Peltier effect and with their coefficients.	6	4	L1
	b	Explain the liquefaction of Helium.	8	4	L2
	c	In a series resonance experiment 50 micro-Farad capacitor connected in series having resistance of 40 ohm resonates at 1000Hz. Identify the inductance of the coil used in the circuit.	6	5	L4

OR

Q10	a	Define thermo emf and Mention the applications of Cryogenics.	6	4	L1
	b	Explain the construction and working of thermos couples. Mention their advantages.	8	4	L2
	c	Identify the wavelength of the laser using the concept of diffraction with given data, grating constant $d = 5.08 \times 10^{-3} \text{ cm}$, $\theta = 1.60$ for 2nd order diffraction.	6	5	L4

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JUNE - JULY 2026

Course:	APPLIED PHYSICS FOR CSE STREAM		
Course Code:	BPHYS102/202	Branches: CSE, ISE, AIML, CSD and AI&DS	
Max Marks:	100	Duration:	03 Hours

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.

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2024 SCHEME

MODULE – 3

Q5	a	Define attenuation in the case of an optical fiber and recall any three causes of attenuation.	6	3	L1
	b	Summarize the construction and working of semiconductor diode laser with neat diagram.	8	3	L2
	c	The angle of acceptance of an optical fiber is 30° when kept in air. Find the angle of acceptance when kept in a medium of refractive index 1.33.	6	3	L3

OR

Q6	a	Brief the working of bar code scanner with neat diagram.	6	3	L1
	b	Illustrate how the expression for numerical aperture of an optical fiber can be obtained and hence mention the condition for ray propagation.	8	3	L2
	c	The ratio of population of two energy levels is 1.059×10^{-30} . Find the wavelength of light emitted by spontaneous emissions at 330 K.	6	3	L3

MODULE – 4

Q7	a	Discuss the merits of quantum free electron theory.	6	4	L1
	b	Deduce the expression for conductivity of an intrinsic semiconductor.	8	4	L2
	c	The Fermi level in silver is 5.5 eV. What are the energies for which the probabilities of occupancy at 300 K are 0.99 and 0.01.	6	4	L3

OR

Q8	a	Brief the limitations of classical free electron theory.	6	4	L1
	b	Define Fermi factor. Explain the variation of Fermi factor with temperature and energy.	8	4	L2
	c	The Hall coefficient of a specimen of doped silicon is found to be $3.66 \times 10^{-4} \text{ m}^3/\text{coulomb}$. The resistivity of a specimen is $9.93 \times 10^{-3} \text{ ohm-m}$. Find the mobility and density of charge carrier, assume single carrier conduction.	6	4	L3

MODULE – 5

Q9	a	Write a note on High Temperature Superconductor.	6	4	L1
	b	Explain BCS theory of superconductivity and discuss the temperature dependence of critical field.	8	4	L2
	c	Identify the acceptance angle and Numerical Acceptance of a given optical fiber with a given data, mean diameter of circle is 3.26 cm, distance between output end of optical fiber and screen is 5 cm	6	5	L4

OR

Q10	a	Brief the working mechanism of Maglev vehicle with neat diagram.	6	4	L1
	b	What is Superconductivity? Describe the Type I and Type II superconductors.	8	4	L2
	c	Examine the color of a laser beam by determining its wavelength through the concept of diffraction using the given data. Given, grating constant $d = 5.08 \times 10^{-3} \text{ cm}$, and $\theta = 1.60^\circ$ for 2 nd order diffraction.	6	5	L4

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JUNE - JULY 2026

Course:	PROBLEM SOLVING THROUGH PROGRAMMING		
Course Code:	BSPSPS103/203	Branches: CSE, ISE, AIML, CSD and AI&DS	
Max Marks:	100	Duration:	03 Hours

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

Page 1 of 2

2024 SCHEME**MODULE – 3**

Q5	a	Define function. Explain the functions terminologies with syntax.	4	3	L1
	b	Write a program to transpose a 3 X 3 matrix.	8	3	L2
	c	Design a program in C to compute GCD and LCM of Two numbers using Euclid's Algorithm and recursion.	8	3	L3

OR

Q6	a	List the applications of arrays.	4	3	L1
	b	Explain the declaration and initialization 2D-array with an example	8	3	L2
	c	Choose with example types of passing parameters to functions.	8	3	L3

MODULE – 4

Q7	a	Differentiate between a Character and a string.	4	4	L1
	b	Explain any four string manipulation functions in C with suitable example.	8	4	L2
	c	Develop a C program that accepts a pointer to an integer and increases the integer's value by a given amount using pointer arithmetic.	8	4	L3

OR

Q8	a	Write a note on Null Pointer and Generic Pointer.	4	4	L1
	b	Write a C program to concatenate two strings without using built in functions.	6	4	L2
	c	Develop a program using pointer to compute the sum, mean and standard deviation of all element stored in array of N real number	10	4	L3

MODULE – 5

Q9	a	What are the different file modes used in the fopen() function?	4	5	L1
	b	Define Structure. Explain the syntax of structure declaration and initialization with an example.	6	5	L2
	c	Create a structure to read, write and compute average marks of the students. List the students scoring above and below the average marks for a class of n students	10	5	L3

OR

Q10	a	What are enumerated data type with suitable example.	4	5	L1
	b	Write a program to read and display information of a student using a structure within a structure.	8	5	L2
	c	Develop a program to write employees details in a file called employee.txt. Then read the record of the nth employee and calculate his salary.	8	5	L3

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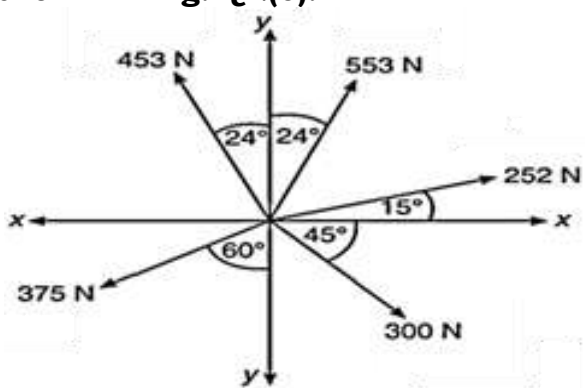
FIRST/SECOND SEMESTER B.E DEGREE SEMESTER END EXAMINATIONS

JUNE - JULY 2026

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	What are the good properties of the following building materials? i) Bricks ii) Structural Steel	5	1	L1
	b	Explain scope of the following branches of Civil Engineering Disciplines i) Transportation Engineering ii) Geotechnical Engineering iii) Surveying	9	1	L2
	c	Explain how Beams and Columns contribute to the overall functionality and stability of a building.	6	1	L3
OR					
Q2	a	What are basic materials used in construction?	5	1	L1
	b	Explain the role of structural engineering in building stability and durability.	9	1	L2
	c	Explain the main branches of civil engineering with examples	6	1	L3
MODULE - 2					
Q3	a	Define Couple and its characteristics.	4	2	L1
	b	State and prove Principle of moments.	8	2	L3
	c	Determine the magnitude, direction and represent the direction of the resultant force shown in Fig. Q2(c) . 	8	2	L3

2024 SCHEME

OR

Q4	a	Define Force and its Characteristics.	4	2	L1
	b	State and Prove Varignon's theorem.	8	2	L3
	c	Four forces are acting on a bolt as shown in Figure 2.C. Determine the magnitude and direction of the resultant force.	8	2	L3

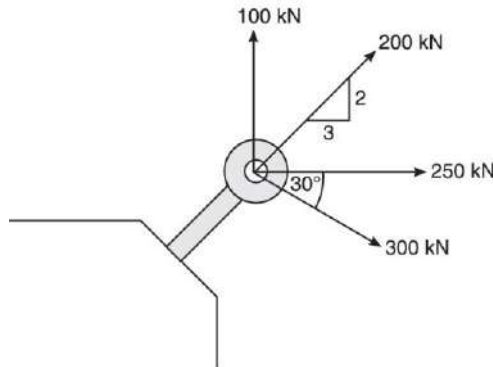


Fig. Q 2(C)

MODULE – 3

Q5	a	What is meant by equilibrium? State the conditions of equilibrium for coplanar concurrent and non-concurrent force system.	4	3	L1
	b	Describe the various types of beams with neat sketches.	8	3	L2
	c	Determine the tension in the strings. Also calculate 'θ' for shown in Fig. Q3(c).	8	3	L3

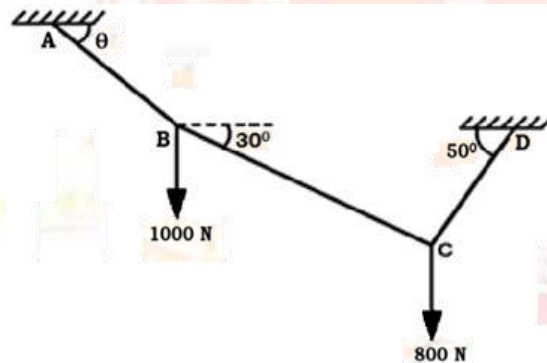


Fig. Q3(c)

OR

Q6	a	State and prove Lami's theorem.	4	3	L3
	b	Describe the various types of Loadings and Supports with neat sketches.	9	3	L2
	c	Determine the reactions at the supports for the beam shown in Fig. Q4(c).	7	3	L3

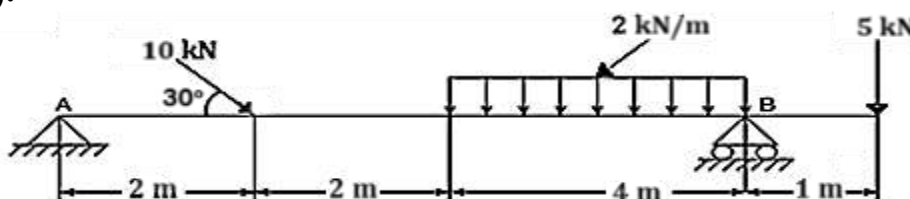
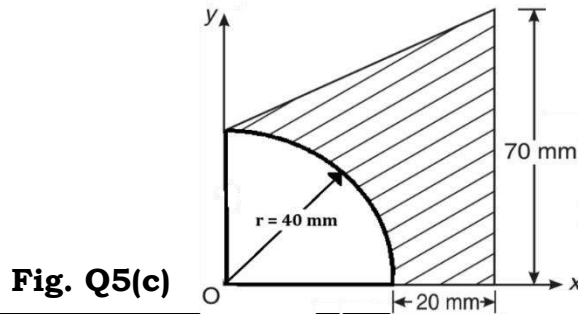


Fig. Q4(c)

2024 SCHEME

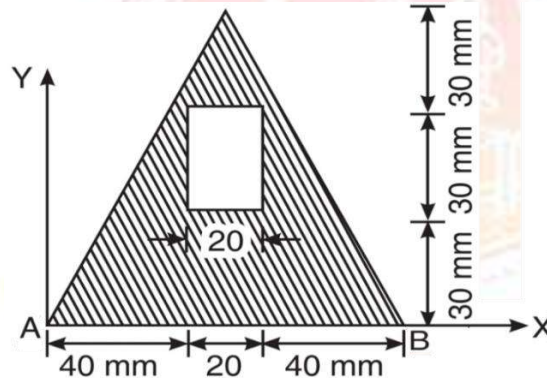
MODULE – 4

Q7	a	Define Centroid and Centroidal Axis, and show them with neat sketches.	4	4	L1
	b	Using integration, derive the expression to determine the location of the centroid of Triangular area.	8	4	L3
	c	Analyze the geometry of the shaded area shown in Fig. Q5(c) . and determine the centroid with respect to the x and y axes.	8	4	L4



OR

Q8	a	State and prove Perpendicular axis theorem with a neat sketch.	4	4	L3
	b	Apply the Perpendicular Axis Theorem to derive the expression for the Moment of Inertia of a Circular area.	8	4	L3
	c	Analyze the geometry of the shaded area in Fig. Q6(c) . and determine its Moment of Inertia about the base and the centroidal axes.	8	4	L4



MODULE – 5

Q9	a	Define Sustainable Development Goals. List the various goals of sustainable development set by United Nations.	6	5	L1
	b	Explain the causes of urban floods and List the remedial measures to control urban floods.	8	5	L2
	c	Explain the roles and benefits of the following in modern buildings: i) Energy-Efficient Buildings. ii) Smart Buildings	6	5	L2

OR

Q10	a	What are the factors considered for identification of landfill sites?	5	5	L1
	b	Explain the Smart city, Clean city and Safe city concepts.	9	5	L2
	c	Explain the importance and benefits of Temperature and Sound Control in Buildings.	6	5	L2

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FIRST/SECOND SEMESTER B.E DEGREE SEMESTER END EXAMINATIONS

JUNE - JULY 2026

Course:	INTRODUCTION TO ELECTRONICS & COMMUNICATION		
Course Code:	BESC104C/204C	Branches: CSE, ISE, AIML, CSD and 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	Write the block diagram of power supply and explain the function of each block.	4	1	L1
	b	An amplifier with negative feedback applied has an open-loop voltage gain of 50 and one-tenth of its output is fed back to the input (i.e. $\beta = 0.1$). Determine the overall voltage gain with negative feedback applied. If, the amplifier's open-loop voltage gain increases by 20%, determine the percentage increase in overall voltage gain.	8	2	L3
	c	what is an amplifier and explain its types?	8	2	L2
OR					
Q2	a	Define the following w r t amplifiers i) input and output resistance ii) voltage and current gain	4	1	L1
	b	With neat circuit diagram and input and output waveform explain the operation of bridge rectifier with capacitor.	8	1	L2
	c	With neat circuit elaborate the operation of voltage doubler. Find the output voltage the circuit, If the input voltage is 3.5V.	8	1	L3
MODULE – 2					
Q3	a	Show the inverting amplifier with a circuit diagram and mention its voltage gain.	4	1	L1
	b	Elaborate the operation of Wein bridge oscillator.	8	2	L3
	c	Explain the summing amplifier using operational amplifier.	8	2	L2
OR					
Q4	a	Mention any four the ideal chacterstics of op-amp.	4	2	L1
	b	With neat circuit diagram and necessary expression elaborate the operation of R-2R ladder network oscillator.	8	2	L2
	c	Interpret the followings with input and output waveform Integrator ii) Differentiator	8	2	L3

2024 SCHEME

MODULE – 3

Q5	a	Show the following i) 10101_2 into decimal ii) 101111010110.110110011_2 into octal iii) 101101011_2 into Hexadecimal iv) 756.603_8 into Hexadecimal	4	2	L1
	b	Simplify the following Boolean function using Boolean Algebra $XY+X(Y+Z)+Y(Y+Z)$	8	2	L2
	c	Analyze the operation of full adder with a truth table and logic diagram.	8	2	L4

OR

Q6	a	Show the block diagram of a sequential logic circuit	4	2	L1
	b	Explain the operation of clocked RS flip-flop	8	2	L2
	c	Analyze the operation of JK flip-flop with necessary sketches.	8	2	L4

MODULE – 4

Q7	a	Relate general purpose computing system to embedded system	4	3	L1
	b	Explain the block diagram of embedded system	8	3	L2
	c	Compare RISC Vs CISC processors	8	3	L4

OR

Q8	a	Define the following i) Microprocessor ii) Microcontroller	4	3	L1
	b	Explain the functional diagram of washing machine.	8	3	L2
	c	Justify the embedded systems in the automotive domain.	8	3	L4

MODULE – 5

Q9	a	Show the amplitude modulation with neat sketches.	10	4	L1
	b	Access the types of multiplexing technique in the analog communication with the block diagram.	10	4	L4

OR

Q10	a	Show the various types of multiple access (FDMA, TDMA, and CDMA) in digital communication.	10	4	L1
	b	Configure the advantages of digital communication over analog communication.	10	4	L4

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SJC INSTITUTE OF TECHNOLOGY
(An Autonomous Institute under VTU, Belagavi)
FIRST/SECOND SEMESTER B.E DEGREE SEMESTER END EXAMINATIONS
JUNE - JULY 2026

Course:	INTRODUCTION TO C-PROGRAMMING		
Course Code:	BESC104E/204E	Branches: ECE, ME, CV, 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	List and explain the characteristics of computers.	5	1	L1
	b	Discuss the following with an example i) Algorithm ii) Flowchart iii) Pseudocode.	10	1	L2
	c	Develop a C program to declare the following variables with their values and print all the declared variables. Emp_num: 10, salary:2156.35, grade:'A', bal_amt:10000000, constant pi : 3.14.	5	2	L3
OR					
Q2	a	Explain the basic structure/Block diagram of a computer.	5	1	L2
	b	Demonstrate the basic structure of C program with an example.	10	1	L2
	c	Develop a C program that computes the size of int, float, char and double.	5	1	L3
MODULE - 2					
Q3	a	Write a C program to find the area of the circle.	4	1	L1
	b	Illustrate the prefix and postfix increment, decrement unary operator with an example program	10	1	L2
	c	Develop a C program to convert the floating point number to the corresponding integer number using typecasting.	6	2	L3
OR					
Q4	a	Explain formatted input and output statements with suitable syntax and example.	4	1	L1
	b	List and explain any four operators used in c language with an example for each.	10	1	L2
	c	Define type conversion. Briefly illustrate the two types of conversion by solving relevant problems.	6	2	L3

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MODULE – 3

Q5	a	Explain the syntax of Switch statement with an example program.	6	1	L1
	b	Illustrate with an example explain the three types of iterative statements.	8	3	L2
	c	Develop a C Program to find the roots of quadratic equation for non-zero co-efficient using if-else ladder construct.	6	3	L3

OR

Q6	a	Explain the register and extern storage class.	4	1	L1
	b	Illustrate the concept of passing parameters to the functions by i) Call by value ii) Call by reference with an example program.	10	3	L2
	c	Develop a C program to find a factorial of a given number using recursive functions.	6	3	L3

MODULE – 4

Q7	a	Given an array int marks[]={99, 67, 78, 56, 88, 90, 34, 85}. Calculate the address of marks[4], if base address =1000.	4	4	L3
	b	Write a C Program to illustrate various String functions present in String.h.	10	4	L2
	c	Write a C program to implement the linear search.	6	4	L3

OR

Q8	a	Explain the declaration and initialization of two dimensional arrays.	4	4	L1
	b	Develop a C program to multiply two m x n matrices.	10	4	L2
	c	Write a program to find the transpose of a given matrix.	6	4	L3

MODULE – 5

Q9	a	Explain the rules for pointer variables.	5	5	L1
	b	Write a C Program to illustrate various string functions present in string h.	10	5	L3
	c	Develop a C program to Check whether a String is Palindrome or not.	5	5	L4

OR

Q10	a	Explain NULL pointers and generic pointers.	4	5	L1
	b	Develop a C program using pointers to compute the sum, mean and standard deviation of all elements stored in an array of N real numbers.	10	5	L3
	c	Write a program using structures to read and display the information about the students(Roll No, Name, Fees, DOB).	6	5	L4

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SJC INSTITUTE OF TECHNOLOGY

(An Autonomous Institute under VTU, Belagavi)

FIRST/SECOND SEMESTER B.E DEGREE SEMESTER END EXAMINATIONS

JUNE - JULY 2026

Course:	INTRODUCTION TO PYTHON PROGRAMMING		
Course Code:	BPLC105/205	Branches: Common to 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	Discuss while and for looping control statements in Python with a syntax and example to each.	6	1	L2
	b	List and explain math operators used in python with example.	6	1	L2
	c	Develop a python program to find the area of square, rectangle and circle. Print the results. Take input from user.	8	1	L3
OR					
Q2	a	Explain the following built in functions with suitable examples. i) print() ii) input() iii) len()	6	1	L2
	b	Illustrate the syntax and control flow diagrams of if, else and elif statements in python with example for each.	6	1	L2
	c	Develop a python program to check whether the number is even or not.	8	1	L3
MODULE – 2					
Q3	a	Discuss local and global variables in python with an example	6	2	L2
	b	Write a program to count the frequency of characters using module PPrint (Pretty Printing).	6	2	L2
	c	Read N numbers from the console and create a list. Develop a program to print mean, variance and standard deviation with suitable messages.	8	2	L3
OR					
Q4	a	Explain str(), int(), and float() functions to convert between data types with examples	6	2	L2
	b	Summarize with a programming example to each: (i) get() (ii) setdefault() iii)keys() iv)values()	6	2	L2
	c	Develop a python program to illustrate user defined functions.	8	2	L3
MODULE – 3					
Q5	a	Explain String Comparison with example.	6	3	L2
	b	Explain how to read specific lines from a file? Illustrate with python program.	6	3	L2

2024 SCHEME

	c	How do you concatenate strings in Python? Write a python program to concatenate two given strings (Read the strings from the user).	8	3	L2
OR					
Q6	a	With an example code explain split() string method.	6	3	L2
	b	Show how to save variables with the shelve method.	6	3	L2
	c	Write a Python program to swap cases of a given string. Input: Java Output: jAVA	8	3	L2
MODULE – 4					
Q7	a	Create a class called Animal with a method called eat that prints “I can eat”. Create two subclasses Dog and Cat that inherits from Animal and overrides the eat method to print “I like to eat bones” and “I like to eat rats” respectively. Demonstrate how inheritance and polymorphism are implemented by creating objects.	6	4	L3
	b	Write a program to illustrate pure function and modifier. Also explain the role of pure functions and modifier functions .	6	4	L3
	c	Explain how operator overloading is achieved in python with suitable snippet code.	8	4	L2
OR					
Q8	a	Develop the class called Rectangle and initialize it with width =100, height=200, starting point as (x=0, y=0). Write a program to display the centre point coordinates of rectangle.	6	4	L3
	b	Write 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 an digit only].	6	4	L3
	c	What is polymorphism? Explain in brief the method overloading with a suitable example.	8	4	L2
MODULE – 5					
Q9	a	What is ndarray in NumPy, and how is it considered the heart of the library?	6	5	L1
	b	List the main data structures in the pandas library?	6	5	L2
	c	Write a Python code snippet to create a line chart using matplotlib.pyplot and include the following customizations. Add a title and axis labels Add a grid Display a legend for multiple plots Save the chart as an image file.	8	5	L4
OR					
Q10	a	Explain how pandas supports indexing, operations between data structures, and function application with mapping. Provide relevant examples.	6	5	L1
	b	Explain how conditions and boolean arrays are used in NumPy. Also, demonstrate how arrays can be manipulated using functions like reshape(), transpose(), and concatenate().	8	5	L2
	c	Develop a Python program to Demonstrate how to Draw a Bar Plot using Matplotlib	6	5	L4



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FIRST/SECOND SEMESTER B.E DEGREE SEMESTER END EXAMINATIONS

JUNE - JULY 2026

Course:	INTRODUCTION TO INTERNET OF THINGS		
Course Code:	BETC105A/BETC205A	Branches: CSE, ISE, ECE, AIML, CSD and 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	List and explain any three types of computer networks based on geographical area.	6	1	L1
	b	What is IOT? Explain the sequence of technological developments leading to the shaping of the modern IOT.	6	1	L2
	c	Illustrate how data is transmitted from one computer to another using the layered model and label each step with the respective OSI layer.	8	1	L3
OR					
Q2	a	Describe the basic architecture of IoT networking components.	6	1	L1
	b	Compare IoT and M2M in terms of internet dependency.	6	1	L2
	c	Identify the Enabling IoT and the Complex Interdependence of Technologies.	6	1	L3
MODULE – 2					
Q3	a	Define sensors. Classify the various sensors based on power requirement.	6	2	L1
	b	Explain the different sensing categories based on the nature of environment being sensed and the physical sensors.	6	2	L2
	c	Given a temperature control system for a smart greenhouse, identify suitable types of sensors and actuators required. Justify your choices based on their characteristics.	8	2	L3
OR					
Q4	a	Write the Basic Outline of the Differences Between Transducers, Actuators, and Sensors.	6	2	L1
	b	Differentiate the categories of sensing with examples.	6	2	L2
	c	Examine the Characteristics of Actuator.	6	2	L3

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MODULE – 3					
Q5	a	Identify the various data formats used in IoT networks and describe their roles briefly.	6	3	L1
	b	Explain different types of processing topologies with the help of a simple sketch.	6	3	L2
	c	Illustrate a data offloading case in a mobile/cloud environment and determine suitable parameters for making offloading decisions.	8	3	L3
OR					
Q6	a	Describe briefly key advantages of NB-IoT for connecting devices in remote locations	6	3	L1
	b	Explain how LoRa achieves its long-range communication capabilities while maintaining low power consumption	6	3	L2
	c	In what specific IoT scenarios would LoRa be a more suitable choice than NB-IoT, and why.	8	3	L3
MODULE – 4					
Q7	a	Define cloud computing. What are the advantages of cloud computing?	6	4	L1
	b	Summarize the different types of cloud simulation tools and explain how they benefit customers.	6	4	L2
	c	Apply the concept of virtualization in a cloud environment and illustrate how it benefits both end users and cloud service providers with suitable examples	8	4	L3
OR					
Q8	a	List the three main cloud service models and define each briefly.	6	4	L1
	b	Describe the purpose of a Service-Level Agreement (SLA) in cloud computing and interpret its role in ensuring service quality	6	4	L2
	c	Apply the concept of a Sensor-Cloud to a real-time monitoring application and justify its use in that scenario	8	4	L3
MODULE – 5					
Q9	a	List and briefly describe the key components of a Smart Irrigation Management System	6	5	L1
	b	Demonstrate how various components of Vehicular IoT work together in a real-time traffic monitoring system	6	5	L3
	c	Analyze a real-world Healthcare IoT system by breaking down its components, and discuss how each contributes to its advantages and potential risks	8	5	L4
OR					
Q10	a	List and briefly describe the key components of the AmbuSens system architecture.	6	5	L1
	b	Apply Machine Learning in an IoT-based system and explain the advantages it provides in that application	6	5	L3
	c	Analyze the components and data flow of an IoT-based system used for in-situ assessment of Leaf Area Index (LAI), and examine how each part contributes to accurate measurement and decision-making	8	5	L4

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FIRST/SECOND SEMESTER B.E DEGREE SEMESTER END EXAMINATIONS

JUNE - JULY 2026

Course:	WASTE MANAGEMENT		
Course Code:	BETC105H/BETC205H	Branches: ME, CV, 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	List and explain the factor affecting waste generation rate.	7	1	L1		
	b	Explain the sources of solid wastes.	7	1	L2		
	c	Estimate the moisture content and density of a solid waste sample with the following composition based on 100kg sample.	6	1	L5		
	Component	by mass in %				Moisture content in %	typical density Kg/m³
	Food waste	20				70	270
	Paper	40				6	80
	Card board	5				5	50
	Plastic	15				2	60
	Garden trimming	5				60	102
Wood	10	20				230	
Tin cans	5	3	90				
OR							
Q2	a	Explain the objectives of Waste Management.	7	1	L1		
	b	Explain the qualification of Waste component by Load Count Analysis	7	1	L2		
	c	Estimate the energy content of a Solid Waste sample with the following data based on 100 klg smaple.	6	1	L5		
	Component	% by mass				Typical Energy in kJ/kg	
	Food waste	20				4650	
	Paper	40				16750	
	Plastic	20				32600	
	Card board	05				16300	
Wood	10	18600					
Tin cans	5	700					
MODULE – 2							
Q3	a	Write the terms and definition: (i) Curb service (ii) Alley service (iii) Set out –Setback Service	6	2	L1		

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	b	Explain with a neat sketch Hauled container system and its advantage and disadvantages.	8	2	L2
	c	Interpret the size reduction of solid waste by using Mechanical process.	6	2	L2
OR					
Q4	a	Explain Bangalore method of composting	6	2	L1
	b	Explain with a neat sketch stationary container system.	8	2	L2
	c	Describe Pyrolysis and Gasification.	6	2	L2
MODULE – 3					
Q5	a	Define construction and demolition waste and explain reuse of the same.	6	3	L1
	b	List the landfill gas collection methods. Explain any one with neat sketch.	7	3	L2
	c	List the methods of Sanitary Land Fill and justify their suitability.	7	3	L3
OR					
Q6	a	List the benefits of Recycling.	6	3	L1
	b	Explain the advantages and disadvantages of land filling?	8	3	L2
	c	Identify the re-use and recycling of glass process technique and explain briefly.	6	3	L3
MODULE – 4					
Q7	a	Define biomedical waste. Explain the types of biomedical waste	6	4	L2
	b	Identify the steps involved in storage and transportation of biomedical waste process.	8	4	L3
	c	Evaluate the effectiveness of autoclaving as a thermal treatment method for biomedical waste	6	5	L3
OR					
Q8	a	Write the legal and regulatory framework for biomedical Waste management.	6	4	L1
	b	Explain the color coding and storage of biomedical waste.	8	4	L2
	c	Identify the disposal and treatment methods of biomedical waste.	6	4	L3
MODULE – 5					
Q9	a	Write the strategies for reducing E-waste generation	6	5	L1
	b	List and describe the different types of e-waste. Provide examples for each type.	6	5	L2
	c	Interpret the waste management in Developing countries and explain briefly.	8	5	L3
OR					
Q10	a	Define E-waste. Explain the sources of E-waste.	6	5	L1
	b	Explain the 3 Pillars of Sustainable E-Waste Management	8	5	L2
	c	Analyze the reuse and refurbishment of electronics products and explain briefly.	6	5	L4