III - IA

SJCIT

IA Evaluation Rubrics

|| Jai Sri Gurudev ||
Sri Adichunchanagiri Shikshana Trust ®

SJC INSTITUTE OF TECHNOLOGY

Chickballapur – 562 101

Estd: 1986

Department of Aeronautical Engineering

IA Evaluation Rubrics

Gas Turbine Technology-18AE644

			IA-3					Total Marks	
			Q1/Q2	Q3/Q4	Q5/Q6	Q7/Q8	Q9/Q10		
			CO3	CO3	CO4	CO4	CO4		
			L3	L2	L2	L2	L2		
SL	USN	Name	10	10	10	10	10	50	30
1	1SJ18AE001	ABDUL RAHMAN J	10	10	10	10	10	50	30
2	1SJ18AE003	AKASH M	10	10	10	10	10	50	30
3	1SJ18AE004	AKASH SIDDANGOUDA PATIL	10	10	10	10	10	50	30
4	1SJ18AE006	ANNASAGARAM GOWTHAMI	10	10	10	10	10	50	30
5	1SJ18AE007	ANUSHREE N	10	10	10	10	10	50	30
6	1SJ18AE008	ARAVIND R NAIDU	10	10	10	10	10	50	30

7	1SJ18AE009	ARJI BHARATH	10	10	10	10	10	50	**30**
8	1SJ18AE011	BHAVANA A J	10	10	10	10	10	50	**30**
9	1SJ18AE012	BINDUSHREE K	10	10	10	10	10	50	**30**
10	1SJ18AE014	CHAVALI BHIMA SANKARAM	10	10	10	10	10	50	**30**
11	1SJ18AE015	CHIDANANDA	10	10	10	10	10	50	**30**
12	1SJ18AE016	DHANUSH KUMAR B K	10	10	10	10	10	50	**30**
13	1SJ18AE017	DURGAPRASAD N S	10	10	10	10	10	50	**30**
14	1SJ18AE018	GIRIDHAR S							**AB**
15	1SJ18AE019	GIRISH N	10	10	10	10	10	50	**30**
16	1SJ18AE021	HARSHA D S	10	10	10	10	10	50	**30**
17	1SJ18AE022	HARSHITH L	10	10	10	10	10	50	**30**
18	1SJ18AE023	HARSHITHA K	10	10	10	10	10	50	**30**
19	1SJ18AE024	HEMANTH B S	10	10	10	10	10	50	**30**
20	1SJ18AE025	JANAPAREDDI SAIKUMAR	10	10	10	10	10	50	**30**
21	1SJ18AE026	K KEERTHIVARDHAN							**AB**
22	1SJ18AE027	KOLLANA YESWANTH	9	9	9	9	9	45	**27**
23	1SJ18AE028	MAHIMA T S	10	10	10	10	10	50	**30**
24	1SJ18AE029	MANIKYA G	10	10	10	10	10	50	**30**
25	1SJ18AE031	MANOJ S	10	10	10	10	10	50	**30**

26	1SJ18AE032	MANOJ SINGH H	10	10	10	10	10	50	**30**
27	1SJ18AE033	MARIYAMBI T S	10	10	10	10	10	50	**30**
28	1SJ18AE034	MEGHASHREE M S	10	10	10	10	10	50	**30**
29	1SJ18AE035	MOHAMMED AZAM	10	10	10	10	10	50	**30**
30	1SJ18AE036	MONIKA CHAVAN A	10	10	10	9	9	48	**29**
31	1SJ18AE037	MYTHRI C	10	10	10	10	10	50	**30**
32	1SJ18AE038	NAGAMANI J V	10	10	10	10	10	50	**30**
33	1SJ18AE039	NAGESH D R	10	10	10	10	10	50	**30**
34	1SJ18AE040	PRAJAKTA S LOKHANDE	10	10	10	10	10	50	**30**
35	1SJ18AE041	PRAMODGOWDA T S	10	10	10	10	10	50	**30**
36	1SJ18AE042	PRASAD BELGUNDKAR	10	10	10	10	10	50	**30**
37	1SJ18AE043	RACHANA J	10	10	10	10	10	50	**30**
38	1SJ18AE044	RAHUL P	10	10	10	10	10	50	**30**
39	1SJ18AE045	RAKESH S	10	10	10	10	10	50	**30**
40	1SJ18AE046	RAMYAKRISHNA K	10	10	10	10	10	50	**30**
41	1SJ18AE048	RAVINDRA SREE CHENDAN SAI	9	9	9	9	9	45	**27**
42	1SJ18AE049	SAI KEERTHAN B L	9	9	9	9	9	45	**27**
43	1SJ18AE050	SAMPRUTHA A R	10	10	10	10	10	50	**30**
44	1SJ18AE051	SOWBHAGYA M R	10	10	10	10	10	50	**30**

45	1SJ18AE052	SRIDHAR K R	10	10	10	10	10	50	**30**
46	1SJ18AE053	UJWAL N	10	10	10	10	10	50	**30**
47	1SJ18AE054	UMESH RANA	9	10	9	10	10	48	**29**
48	1SJ18AE055	USHA G	10	10	10	10	10	50	**30**
49	1SJ18AE056	VAISHAK M	7	7	7	7	7	35	**21**
50	1SJ18AE057	VARUN M	10	10	10	10	10	50	**30**
51	1SJ18AE058	VEERESH	10	10	10	10	10	50	**30**
52	1SJ18AE059	VIGNESH GOWDA P	10	10	10	10	10	50	**30**
53	1SJ18AE060	YASHWANTH R	10	10	10	10	10	50	**30**
54	1SJ18AE061	YASHWANTH S	10	10	10	10	10	50	**30**
55	1SJ18AE062	YASHWANTH T H	10	10	10	10	10	50	**30**
56	1SJ18AE064	NARINDER KUMAR	9	9	9	9	9	45	**27**
57	1SJ18AE065	MOHAN REDDY	10	10	10	10	10	50	**30**

Cheryl M B 9/8/21

Faculty In-Charge

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II-IA

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IA Evaluation Rubrics

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Estd: 1986

Department of Aeronautical Engineering

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Gas Turbine Technology-18AE644

			IA-2					Total Marks	
			Q1/Q2	Q3/Q4	Q5/Q6	Q7/Q8	Q9/Q10		
			CO1	CO1	CO2	CO2	CO2		
			L2	L2	L2	L2	L2		
SL	USN	Name	10	10	10	10	10	50	30
1	1SJ18AE001	ABDUL RAHMAN J	10	10	10	10	10	50	30
2	1SJ18AE003	AKASH M	10	10	10	10	10	50	30
3	1SJ18AE004	AKASH SIDDANGOUDA PATIL	10	10	10	10	10	50	30
4	1SJ18AE006	ANNASAGARAM GOWTHAMI	10	10	10	10	10	50	30
5	1SJ18AE007	ANUSHREE N	10	10	10	10	10	50	30
6	1SJ18AE008	ARAVIND R NAIDU	10	10	9	9	10	48	29

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IA Evaluation Rubrics

7	1SJ18AE009	ARJI BHARATH	6	6	6	6	6	30	**18**
8	1SJ18AE011	BHAVANA A J	9	9	9	9	9	45	**27**
9	1SJ18AE012	BINDUSHREE K	10	10	9	9	10	48	**29**
10	1SJ18AE014	CHAVALI BHIMA SANKARAM	7	8	8	8	9	40	**24**
11	1SJ18AE015	CHIDANANDA	7	7	7	7	7	35	**21**
12	1SJ18AE016	DHANUSH KUMAR B K	10	10	9	9	10	48	**29**
13	1SJ18AE017	DURGAPRASAD N S	10	10	10	10	10	50	**30**
14	1SJ18AE018	GIRIDHAR S							**AB**
15	1SJ18AE019	GIRISH N	10	10	10	10	10	50	**30**
16	1SJ18AE021	HARSHA D S	9	9	9	9	9	45	**27**
17	1SJ18AE022	HARSHITH L	10	10	9	9	10	48	**29**
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21	1SJ18AE026	K KEERTHIVARDHAN	9	9	9	9	9	45	**27**
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24	1SJ18AE029	MANIKYA G	9	9	9	9	9	45	**27**
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28	1SJ18AE034	MEGHASHREE M S	10	10	10	10	10	50	**30**
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35	1SJ18AE041	PRAMODGOWDA T S	9	10	10	9	10	48	**29**
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37	1SJ18AE043	RACHANA J	9	9	9	9	9	45	**27**
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55	1SJ18AE062	YASHWANTH T H	9	9	9	9	9	45	**27**
56	1SJ18AE064	NARINDER KUMAR	6	6	6	6	6	30	**18**
57	1SJ18AE065	MOHAN REDDY	10	10	10	10	10	50	**30**

MB 30/6/21

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I-IA.

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Estd: 1986

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Gas Turbine Technology-18AE644

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			Q1/Q2	Q3/Q4	Q5/Q6	Q7/Q8	Q9/Q10		
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			L2	L2	L2	L2	L2		
SL	USN	Name	10	10	10	10	10	50	30
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49	1SJ18AE056	VAISHAK M	9	9	9	9	8	44	**26**
50	1SJ18AE057	VARUN M	9	9	9	9	8	44	**26**
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27	1SJ18AE033	MARIYAMBI T S	10	10	10	10	10	50	**30**
28	1SJ18AE034	MEGHASHREE M S	10	10	10	10	10	50	**30**
29	1SJ18AE035	MOHAMMED AZAM	10	10	10	10	10	50	**30**
30	1SJ18AE036	MONIKA CHAVAN A	10	10	10	10	10	50	**30**
31	1SJ18AE037	MYTHRI C	10	10	10	9	9	48	**29**
32	1SJ18AE038	NAGAMANI J V	10	10	10	10	10	50	**30**
33	1SJ18AE039	NAGESH D R	10	10	10	10	10	50	**30**
34	1SJ18AE040	PRAJAKTA S LOKHANDE	10	10	10	10	10	50	**30**
35	1SJ18AE041	PRAMODGOWDA T S	10	10	10	10	10	50	**30**
36	1SJ18AE042	PRASAD BELGUNDKAR	10	10	10	10	10	50	**30**
37	1SJ18AE043	RACHANA J	10	10	10	10	10	50	**30**
38	1SJ18AE044	RAHUL P	10	10	10	9	9	48	**29**

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55	1SJ18AE062	YASHWANTH T H	9	9	9	9	10	46	**27**
56	1SJ18AE064	NARINDER KUMAR	8	8	8	8	8	40	**24**
57	1SJ18AE065	MOHAN REDDY	10	10	10	10	10	50	**30**

31/5/21

Faculty In-Charge

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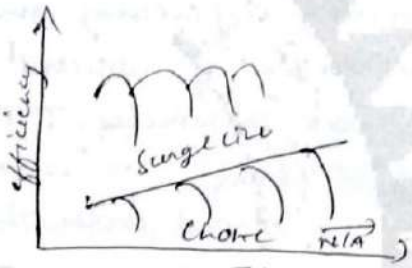
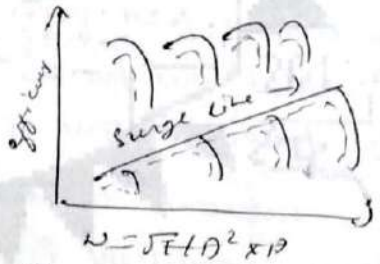
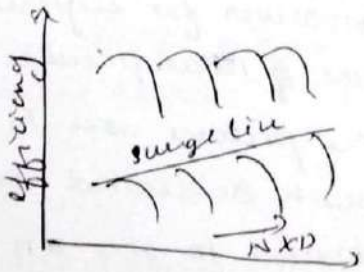
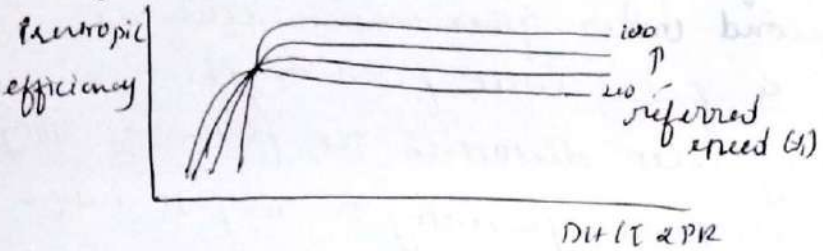
DEPARTMENT: AERONAUTICAL ENGINEERING

Scheme & Solutions- TEST- I/II/III **Date:** 06/08/21

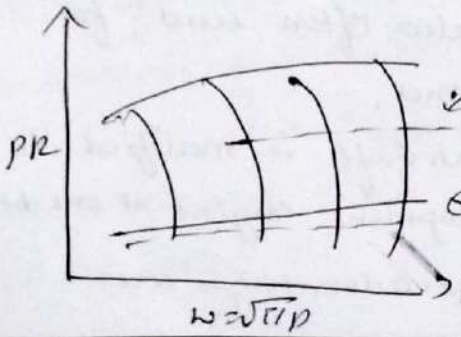
Semester: VI **Subject Title:** Gas turbine technology **Subject Code:** 18AE644

Question Number	Solution	Marks Allocated
1	compressor map for testing and performance * Ignoring second order phenomena such as ruffels for a fixed inlet flow angle. * No rotating inlet distortion the following apply * For a fixed compressor geometry the map is unique * Each operating point on the map has a unique velocity triangle.  $U = \sqrt{T}/P$ axial compressor maps Reynolds number and Tc effects :- When Re falls below the critical value viscous flow effects have and order effects leading to lower flow, pressure ratio & efficiency  $N = \sqrt{T}/A^2 \times P$ The compressor map effect of reynold's number Long compressor maps into engine off design performance models beta lines, a plat of pressure ratio v/s flow.  	1 1 1 2 1 2 1 1 10

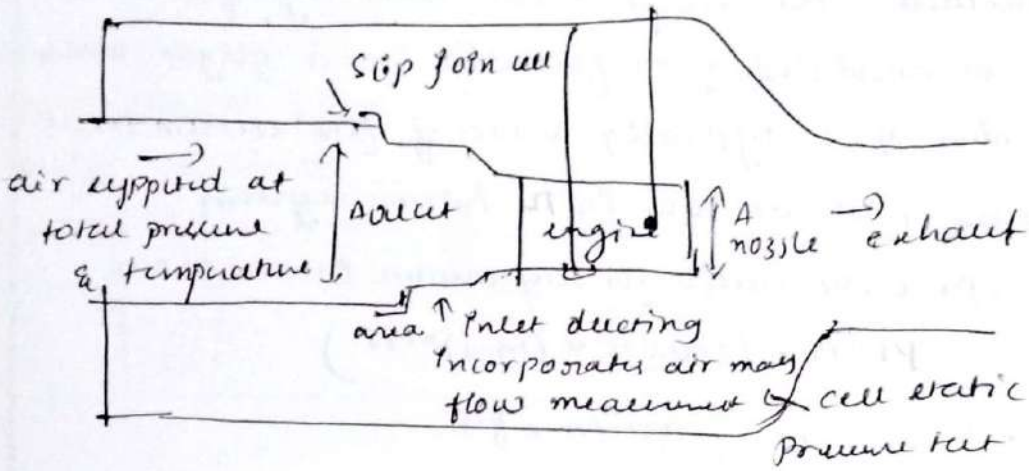
Subject Title: Gas turbine technology **Subject Code:** 18AE644

Question Number	Solution	Marks Allocated
2	once the turbine geometry has been fixed at the design point then the turbine maps may be generated to define its performance under all off design conditions.	1
		1 2 1
	capacity, efficiency and exit swirl angle are plotted for lines of constant referred speed versus the work parameter. This operating regime is termed choke.	2
	Ignoring second order phenomena such as Reynolds number effects,	2
	• For a fixed turbine geometry the map is unique • Each operating point on the maps has a unique velocity triangle.	1
	The turbine test prior to engine testing, are only carried out for the highest technology engines. The turbine output is absorbed by a water brake	10
3	For subsonic intakes, ram recovery at off design conditions is calculated in the same fashion as for other ducts using either lambda or alpha.	2
	However for supersonic intakes there is additional loss of total pressure ratio across the shock.	2
	The pressure loss in the downstream section must be derived and the two values multiplied together to give an Overall exit pressure.	1

Subject Title: Gas turbine technology **Subject Code:** 18AE644

Question Number	Solution	Marks Allocated
	If needed, the overall ram recovery factor can then be calculated from formula. At a flight mach number of 2, typically 8-10% of free stream total pressure will be lost in the intake system	2
	i. pressure ratio for supersonic intake shows $P_1 = P_0 * (1 - 0.075 * (M-1)^{1.35})$	1
	ii. Ram Recovery factor = fn $RRF = (P_1 - P_{amb})/(P_0 - P_{amb})$.	1 / 10
4	Inlet distortion, which is spatial variation of inlet pressure or temperature can significantly affect the overall compressor map.	1
	The DC60 coefficient is usually employed to quality the degree of inlet pressure distortion. This is the difference between the average total pressure in the most distorted 60° sector and the 360° intake divided by the	1
	* -0.2 for a civil subsonic transport	1
	* -0.9 for a military flighter aircraft	1
	* less than -0.1 is usual for industrial, marian automotive engines	1
		2 / 1 / 1 / 10

Subject Title: Gas turbine technology **Subject Code:** 18AE644

Question Number	Solution	Marks Allocated
5		2
	* Thrust or shaft power test beds may be housed within an altitude test facility (ATF), which reproduces the inlet conditions resulting from altitude and flight mach number	1 1
	* To simulate both ambient condition and flight mach number engine inlet total pressure and temp must be controlled to the ram	1 1
	* These parameters be mostly sub ambient at altitude, hence common feature of the various types of ATF are substantial pressure reduction	1 1
	Advantages:	
	* A full of ambient and flight condition can be tested at one geographical location.	1 1
	* High availability, Independence of weather conditions.	1
6	Flying test bed:	10
	• A flying test bed is also often used for major aero-engine programmes.	2
	• Typically a four engine aircraft is modified to mount a single, new development engine at one berth	2
	• Compared with an ATF the advantages are:	

Subject Title: Gas turbine technology **Subject Code:** 18AE644

Question Number	Solution	Marks Allocated
	• Better simulation of functional effects such as circuit loads and inlet distortion	1
	• Lower capital cost	
	* Propelling nozzle thrust coefficient and capacity are measured directly, from rig and engine tests, ideally in an ATF.	2
	• Nozzle mass flow may now be calculated, along with exit velocity.	1
	• Fuel flow is measured directly	1
	• Inlet air flow may now be calculated	1
	• Net thrust is the difference between the total exit and inlet momentum	1
		10
7	Preliminary flight rating test	1 X 10
	* Endurance test	
	* Power lever torque	
	* Engine component tests	= 10
	* Altitude test	
	* Engine pressure test	
	* Rotor structural integrity test	
	* Engine static load test	
	* vibration test	
	* critical speeds	
	* Vibration and stress analysis	
	Qualification test (QT)	
	* Endurance test	
	* Environmental ingestion	
	* Life assessment test	
	* Reliability	

Subject Title: Gas turbine technology **Subject Code:** 18AEGAS

Question Number	Solution	Marks Allocated
	* Humidity * Fungus * corrosion susceptibility * Armament gas ingestion * Nuclear hardening * Infrared radiation test	
8	Acceptance test:- Acceptance tests are conducted on each engine submitted for delivery. These tests are subset of QT, prepared by engine contractor and submitted for approval by user service as an acceptance test procedure (APT) documen. Acceptance tests of gas turbines with emission control and for power augmentation devices that are based on fluid injection and for inlet air treatment. Reliability test: • Reliability is the ability to perform a required function under stated conditions for a stated period of time. • Reliability qualification involves three phases:- apportionment, prediction and analysis, Maintain-ability qualification follow a similar approach * Failure mode, effect and criticality analysis and fault tree analysis are helpful qualitative tools for design assurance.	1 1 1 2 1 1 1 2 10

Subject Title: Gas turbine technology **Subject Code:** 18AE644

Question Number	Solution	Marks Allocated
	engine are the turbine and disks * blades must also resist the high bending loads * Engine vibration and fatigue resistance will also have same influence on the selection of blades & disks. (iii) Resistance to oxidation and corrosion:- * Corrosion and oxidation are results of electrical & chemical reactions with other materials. * One solution to the problem of oxidation at elevated temp has been the development & use of ceramic coating.	
9	Heat ranges of Metals Aluminium alloys:- • used in temperature ranges up to 260°c, with low density, good strength-to-weight ratios, alumium forgins & castings are used extensively	2
	• Titanium alloys:- used for centrifugal-flow rotors, axial-flow compressor wheels and blades, high strength with low density, suitable for application up to 538°c	2
	• steel alloys:- This group includes high-chromium & high-nickel iron base alloys, relatively low material cost, ease of fabrication, and good mechanical properties, low-alloys steels are commonly used	2
	• Nickel-Base alloys:- These constitute some of the best metals. used in turbine wheels, shafts, spacers etc	2
	• Cobalt-Base alloys:- used in afterburners, turbine vanes and blades etc	2 10

Subject Title: Gas turbine technology **Subject Code:** 18AE644

Question Number	Solution	Marks Allocated
10	Ceramics:-	
	* Experiments are being performed using ceramic materials in many of the engines hot-section parts	1
	* Glass ceramics reinforced with fiber - also show promise for use in gas turbine engines	1
	* Advances in material development and new cooling techniques have allowed modern engines to be designed.	2
	Composite materials	1
	* Relatively new type of materials called composites are coming to the foreground for use in both air frames and engines.	2
	* In these products graphite, glass or boron filaments are embedded in an epoxy-resin matrix or base substance.	2
		1
		10

Chaya MB
2/8/21
[Faculty Incharge]

DEPARTMENT: AERONAUTICAL ENGINEERING

Scheme & Solutions- TEST- I/II/III **Date:** 26/6/21

Semester: VI **Subject Title:** Gas turbine Technology **Subject Code:** 18AE644

Question Number	Solution	Marks Allocated
(1)	FADEC is primarily an interface between the engine and aircraft. It affects the engine in the following manner.	1 1
	• Efficiency of engine is improved by controlling the following variable stator vanes, Nacelle cooling and engine oil cooling. Engine is protected by limited critical speeds and pressure thrust and over boost	1 1
	• Engine maintenance made easier by incorporation for system for engine monitoring, self-testing and fault isolation.	1
	FADEC interface with engine	
	Inputs to the FADEC from engine.	
	• N_2 rpm and power, comes from the FADEC alternator and is used for limiting scheduling system and setting engine speeds.	1 1
	• N_1 rpm, which comes from FADEC transducer	1
	• Exhaust gas temperature (T_{EGT}), oil temperature (T_{OIL}) comes from the main gearbox.	1 1
	• Inlet total pressure (P_{T2}), comes from the inlet cowl.	1
	• Burner pressure (P_{B}), comes from diffuser case.	10
(2)	Typical oil systems and its components	1
	TLA oil-system component used on gas turbine are:-	
	(i) oil Tank (s) (ii) Pressure pump (s) (iii) scavenger pumps	1
	(4) Filters (5) oil coolers (6) Relief valves (7) pressure and temperature gages (8) Temperature regulating valve	1

Subject Title: Gas turbine technology **Subject Code:** 18AE6

Question Number	Solution	Marks Allocated
	(9) oil jet nozzles (10) fitting, valves and plumbing (11) seals.	1
	oil tanks:- Tanks can be either an airframe-supplied or engine-manufacturer supplied unit. usually constructed of welded sheet aluminum or steel, the tank provides a storage place for the oil	1
	Pressure pumps: Both the gear-and gerotor-type pumps are used in the lubricating system of the turbine engine. The pressure developed is proportional to engine rpm up to the time the relief valve opens.	1
	Filters:- The three basic types of oil filters for the jet engine are the cartridge, screen, and screen-disk types. The cartridge filter must be replaced periodically, while the other two can be cleaned and reused.	1
	Oil cooler: The oil cooler is used to reduce the temperature of the oil by transmitting heat from the oil to another fluid.	1
	Seals: Dynamic seals are used in gas turbine engines • Rubbing or contact seals • Non rubbing labyrinth or clearance seals	1 / 10
3	Typical fuel system consists of	1
	• Fuel pump • fuel control • overspeed governor • Fuel oil cooler • fuel pressurizing valve • fuel manifolds • Fuel manifold drain valve • Fuel nozzles • Actuator assembly • Bleed valves • Fuel flowmeter.	1

Subject Title: Gas Turbine technology **Subject Code:** 18AE644

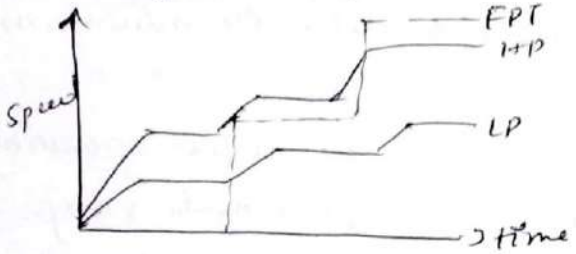
Question Number	Solution	Marks Allocated
	fuel pump:-	
	The fuel pump comprises a single element, positive displacement pump, centrifugal boost pump, filter and bypass circuit with a pressure - relief valve.	2
	Fuel control:	
	The fuel control is mounted on and driven by the fuel pump. The fuel-regulating section meters fuel to the engine under all operating conditions	1
	Fuel oil cooler:-	1
	The oil cooler is used to reduce the temperature of the oil by transmitting heat from the oil	
	Fuel nozzles:-	2
	Twelve fuel nozzles, mounted on the main frame, spray atomized fuel into the combustion chamber.	10
4	* Electric motor starter	
	* Electric motor generator (starter generator)	1 X 10
	* Pneumatic or air turbine starter	
	* cartridge or solid propellant starter	= 10
	* fuel - air combustion starter	
	* Gas turbine starter (Jet fuel starts)	
	* hydraulic motor starter	
	* Liquid monopropellant starter.	
	* Air - impingement starter	
	* Hand - crank starter	

Subject Title: Gas turbine technology **Subject Code:** 18AE64

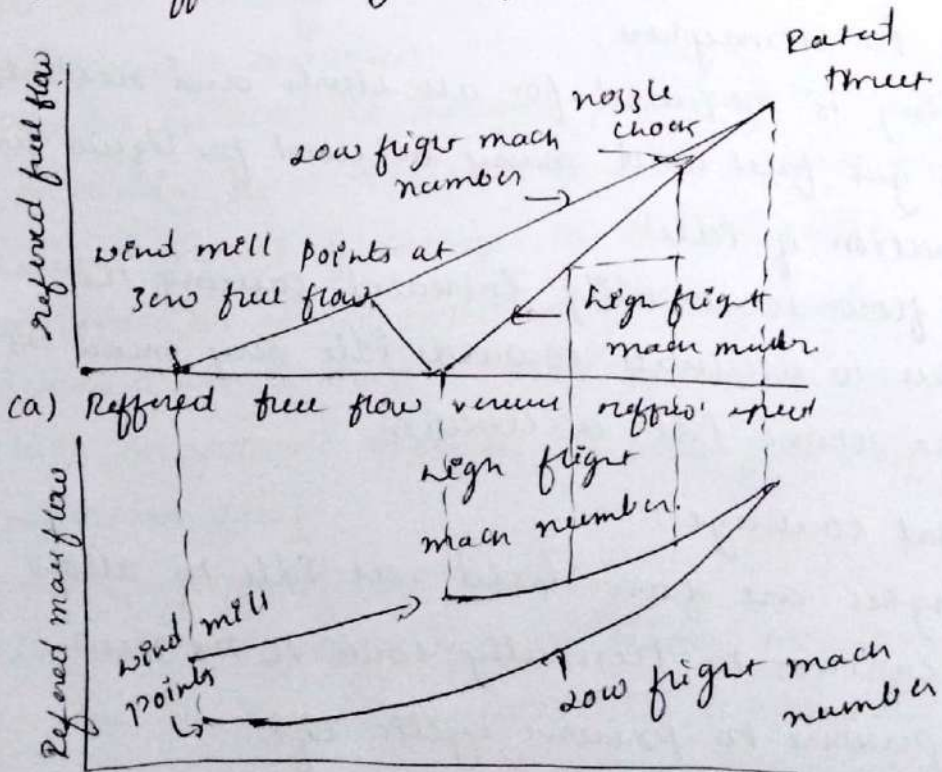
Question Number	Solution	Marks Allocated
5	Transient puformance :- Transient puformance deals with the operating regime where engine puformance parameters are changing with time. Engine operation during transient maneuvers is often referred to as handing. Transient puformance phenomena Heat soakage : • During transient operation there are significant net heat fluxes between the working fluid and the engine metal. This net heat transfer from the working fluid to the metal is termed heat soakage and has a significant effect on engine Volume packing : • During steady state operation the mass flow entering a given volume, such as a duct, is equal to that leaving Tip clearance changes : • During an accel the thermal growth of the compressor or turbine discs is slower than the pressure and thermal growth of casings to be increased. Heat transfer within multi-stage components : Where a single map is used to model a multi-stage component such as an axial flow compressor, . combustion delay • control system delays and lags : In addition, control system sensors measuring parameters such as pressures and temperatures will show delays.	2 2 2 2 2 10

06#Form#03 - Rev. No. 00

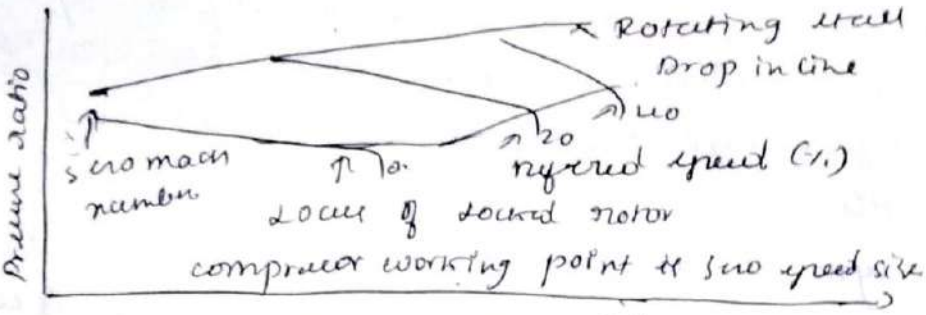
Subject Title: Gas turbine technology **Subject Code:** 18AE644

Question Number	Solution	Marks Allocated
6	Start phases:- The key phases of a start are briefly defined below. Each is then comprehensively described in ensuing sections Dry cranking:- • The engine HP shaft is a rotated by the starter with no fuel being metered to the combustor  Two spool gas generator plus free power turbine powergen engine Purging:- * The engine is also cranked at a max speed the starter can sustain, which purges any fuel into the atmosphere * purging is required for all starts and restarts with gas fuel and many be used for liquid fuel Acceleration of idle:- * Fuel flow is steadily increased causing the energies to accelerate towards idle very much as per the above idle acceleration Thermal soakage:- * Engines are often held at idle to allow the carcass to thermally soak to the new temperature to preserve cyclic life.	2 2 2 2 2 10

Subject Title: Gas turbine technology **Subject Code:** 18AE644

Question Number	Solution	Marks Allocated
7	Surge margin is defined by: $SM = 100 \times \frac{PR_{surge} \times PR_{Working\ line}}{PR_{working\ line}}$	2
	* This is the internationally accepted SAE definition,	1
	* The minimum steady state surge margin required will depend upto upon the engine configuration and application requirements	1
	* The power or thrust level at which the minimum surge margin occurs will also vary.	1 2
	* For each engine application the worst operating conditions and transient requirements vary and it is not possible to cover all combinations	2
	* once the required margins. there have been achieved. The values resulting at some other single operating condition may be compared for different engine types.	1 10
8	 	2 2 1

Subject Title: Gas turbine technology **Subject Code:** 18AE644

Question Number	Solution	Marks Allocated
	(b) Referred mass flow versus referred speed	1
		2
	(c) compressor working points	
	Windmilling occurs when air flowing through an unit engine causes speed rotation. This phenomenon applies mostly to aircraft engines.	1 1 10
9	* Engine performance parameters * cycle design parameters * Mechanical design parameters * Life parameters * fuel type	2
	(i) cycle design parameters : Changes in component performance parameters have a secondary effect on the optimum values * overall pressure ratio * stator outlet temperature * Fan pressure ratio * By pass ratio	2 X 2 = 4
	(ii) Mechanical design parameters : * creep as a function of material type, metal temperature, stress level or AN, * oxidation as a function of material and coating type and metal temperature * shaft critical speed * Choke or stall flutter as a function of fan	2 X 2 = 4 10

Subject Title: Gas turbine technology **Subject Code:** 18AE644

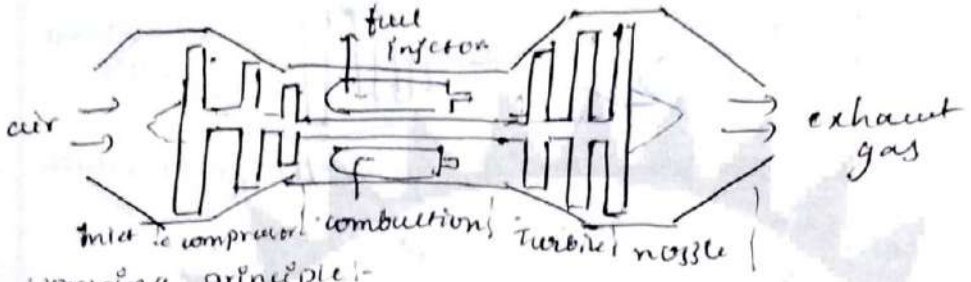
Question Number	Solution	Marks Allocated
10	A method of monitoring the gas turbine engine's day-to-day condition has been adopted by many operators. In this system the EPR rpm, FF= fuel flow, EGT (exhaust gas temperature). and throttle position are used to determine the aerodynamic performance of the engine. While vibration amplitude and oil consumption is used. Although specific procedure will vary from operator to operator, in general. Engine performance monitoring is proving to be a very effective method of providing early warning information of ongoing or impending failures, thus reducing unscheduled delays and more serious engine failures.	1 1 1 1 1 1 1 1 1 1 10

Checked MB
26/6/21
[Faculty Incharge]

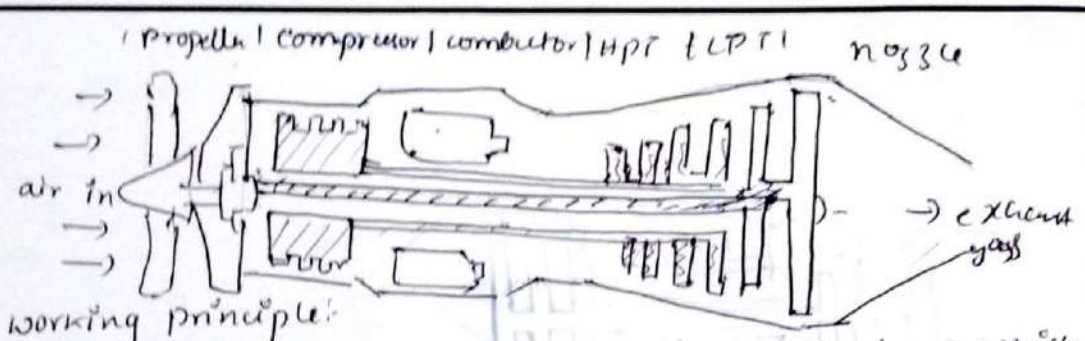
DEPARTMENT: AERONAUTICAL ENGINEERING

Scheme & Solutions- TEST- I/II/III **Date:** 26/5/2

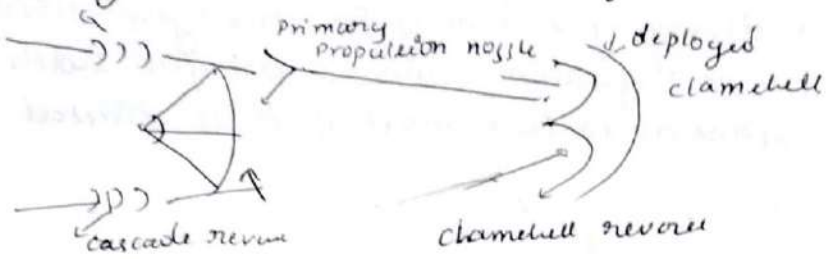
Semester: VI **Subject Title:** Gas turbine technology **Subject Code:** 18AE

Question Number	Solution	Marks Allocated
1		2
	Working principle :-	
	• The air taken in from the opening in the front of the engine is compressed. Fuel is added to the air and burned in a combustion chamber to raise the temperature.	1
	• The exces pressure is sent to the nozzle to produce a high velocity stream of gas which produce thrust.	1
	• An afterburner purpose is to provide a temporary increase in thrust at the time of supersonic flight.	1
	Characteristics :-	
	• Low thrust at low forward speed, Relatively high thrust specific fuel consumption, long take off roll.	1
	• Lightest specific weight.	
	Advantages :	
	• It is simple, easy maintain and requires lower lubricating oil, There is no limit to the power.	1
	Disadvantages :-	
	• The fuel economy at low operational speeds is extremely poor.	1
	• It has low takeoff thrust and hence poor starting characteristics	1
		1
		10

Subject Title: Gas turbine technology **Subject Code:** 18AE644

Question Number	Solution	Marks Allocated
(a)		2
	Working principle: • A turbofan engine has a large fan at the front, which sucks in air.	1
	• compared to a turbojet engine, turboprop engine has better propulsion efficiency	1
	• turboprop engine drives its propulsion by conversion of gas stream energy into mechanical power to drive the compressor.	1
	Advantages:- • It has higher thrust at take off and better fuel economy.	1
	• The frontal area is less than propeller engines so that drag is reduced, easy to maintain	2
	Disadvantages:- • The main disadvantage is that at high speed, due to shocks and flow operation	2
	• It requires a reduction gear which increases the cost and also consumes certain amount of energy.	2
		10
3	(i) Thrust reversal method: A jet powered aircraft during its landing run, lacks the braking action afforded by slow turning propellers, which on larger aircraft are capable of going into reverse pitch giving reverse thrust.	1 1 1
	Types of thrust reversers	10

Subject Title: Gas turbine technology **Subject Code:** 18AE644

Question Number	Solution	Marks Allocated
	Two basic types • postexit or target type / clamshell • preexit using cascades or blocker / deflector doors	2
		2
	(ii) Thrust augmentation :- water injection :- A reduction in atmospheric pressure due to increasing altitude or temperature will therefore cause a reduction in thrust or shaft horse-power. Power under these circumstances can be restored or even boosted as much as 10 to 30% for take off by the use of water injection.	2 2 10
4	(i) The noise problem created by commercial and military jet take offs, landings, and ground operations at airports near residential areas has become serious within the last several year. The decibel (dB) is defined as approximately the smallest degree of difference of loudness ordinarily detectable by the human ear, the range of which includes about 130 dB.	1 1 1 2
	(ii) Convergent divergent nozzle : • If the pressure at the entrance to a convergent duct becomes approximately twice that at the exit of the duct. • At high mach numbers the pressure ratio across	1 1

Subject Title: Gas turbine technology **Subject Code:** 18AE644

Question Number	Solution	Marks Allocated
	the duct will become greater than 2.0 • In the diverging section, the gas velocity can be increased above the speed of sound. • The diverging section of the convergent-divergent nozzle allows expansion outward but also holds in the expansion so that most of it is directed rearward	1 2

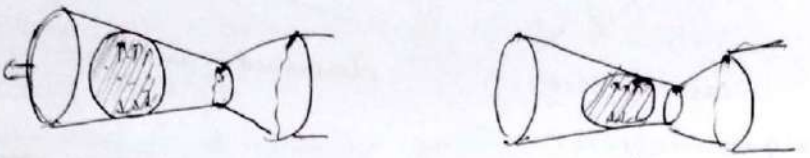


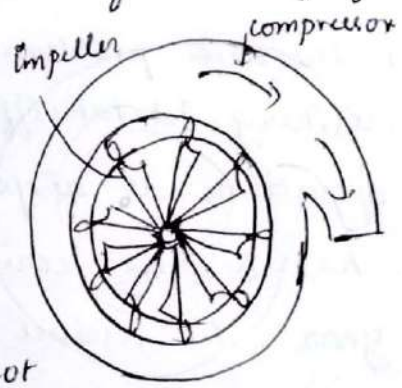
fig: The ball analogy showing thrust increase by means of divergent nozzle

10

5 Types of compressor:-
- centrifugal flow compressor
- Axial flow compressor
- centrifugal-axial flow compressor

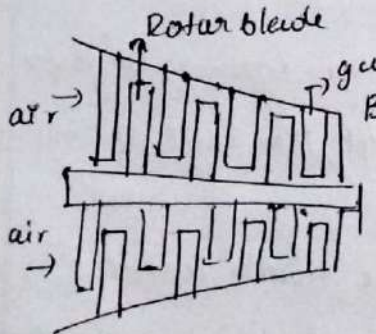
2

(i) The centrifugal compressor consists of basically of an impeller and a diffuser manifold



- As the impeller revolves at high speed, air is drawn in at inducer 2
- centrifugal force provides high speed
- The total compression is shared b/w the rotor and the diffuser does not work on the air 2

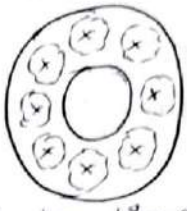
(ii) The axial flow compressor is made up of a series of rotating airfoils called rotor blades and a stationary set of airfoils called stator vanes



- Some axial flow have two or more compressors or spools 2
- Axial compressors have the advantage of being capable of very high compression ratios with relatively very high efficiencies 2

10

Subject Title: Gas turbine technology **Subject Code:** 18AE644

Question Number	Solution	Marks Allocated
6	(iii) Types of Burner types: Burner type → i) can or tubular ii) Annular iii) can-annular (i)  (ii)  (iii)  (i) • Each can has it own fuel injector, ignitor, liner and casing. • primary air from the compressor is guided to each individual can, where it is decelerated, Each can consists of its own air outer with a flame tube inside. • The chamber cans are all interconnected. Advantages: low development cost, favorable fuel distribution, Good accessibility for servicing Disadvantage: ignition problems may occur, particularly at high altitudes (ii). some axial compressor engine have a single annular combustion chamber consist of a single flame tube. • In this combustion chamber fuel is introduced through a series of nozzles at the upstream end of the liner. Advantages * Low pressure losses * Small size * Good ignition behavior Disadvantages: * maintenance & inspection are difficult * Improper combustion due to uneven fuel air distribution (iii). This type of combustion chamber design is used on many large turbojet and turbofan engines • Individual burner cans are placed side by side to form a circle of cans inside an annular space b/w.	2 1 1 1 1 1 1

Subject Title: Gas turbine technology **Subject Code:** 18AE644

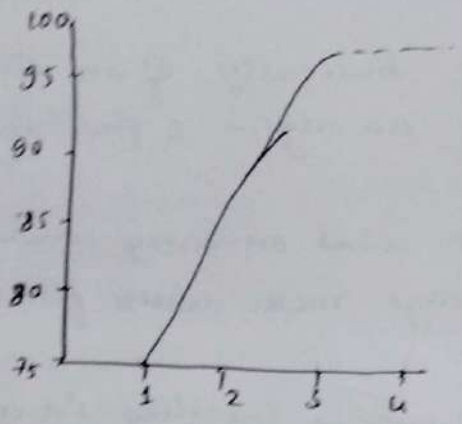
Question Number	Solution	Marks Allocated
	Advantages:- * They are suitable for large engine and for mechanical reasons, engines with high pressure ratios.	1
	Disadvantages:- * The aerodynamic properties are inferior to that of an annular combustor.	10
7	• Strength:- creep strength, Yield strength, Rupture strength, ultimate tensile strength.	1
	• Ductility - The ability of a metal to deform without bearing	1
	• Melting point - The temperature at which the metal becomes a liquid	1
	• Hardness - An important characteristic in that it influences ease of manufacture and therefore cost.	1
	• casting:- A process whereby metal, in a molten state.	1
	• Forging:- A process of plastic deformation under a pressure that may be slowly or quickly applied	1
	• Extrusion:- Metal is pushed through a die to form various cross-sectional shapes	1
	• corrosion and oxidation resistance - An important factor that indicates how well a metal can resist the corrosive effects of the hot exhaust stream.	2
		10
8	(i) Thermal shock resistance:- * Many materials otherwise quite suitable must be rejected because of their poor thermal shock characteristics	2
	* Several engine failure have been attributed to thermal shock on the turbine disk	2
	* Improved fuel controls starting techniques and engine design have this problem	2
	(ii) High-temperature strength:- * The most highly stressed parts of the gas turbine	2 10

06AForm003 - Rev. No. 00

Subject Title: Gas turbine technology **Subject Code:** 18AE644

Question Number	Solution	Marks Allocated
9	* Open air test bed • This is consisted basically of an open air stand supporting an engine & provide thrust measurement • The effects of cross wind on entry conditions are neglected by a large mesh screen fitted around the engine inlet *Ground testing of engine installed in aircraft • power level * fuel shut off value * EPR gauge * percentage of rpm gauge * EGT / ITT gage * fuel flow gage * Torque meter gage * Jet thrust measurement in flight • One of the more common methods is called jet thrust flow measurement method. * Infrared radiation test:	2 2 2 2 2 10
10	(i) one of the more common methods is called the jet flow measurment method. The method works reasonably well on all types of jet engines and can be used as a check on other methods * The gross thrust is determined by measuring the engine pressure ratio (EPR) and solving for gross thrust by use of the equations	2 2 2

Subject Title: Gas turbine technology **Subject Code:** 18AE644

Question Number	Solution	Marks Allocated
		2
	• Thrust coefficient is determined by measuring the engine pressure thrust as a function of EPR.	1
	(ii) the CUSUM plots : changes in component manufacture or build practice may cause increasing numbers of engines to fail the pass off test. Identifying these changes early amongst the general scatter is challenging. Though some special instrumentation may be fitted for the pass off test.	1
		10

Chessel M·B
26/5/21
[Faculty Incharge]

Internal Test Question paper
Name of the staff/s: CHANDRIKA M B Date: 06/08/2021 Signature: Chandrika MB 6/8/21
Reviewer's Signature:

S.J.C. Institute of Technology
Department of Aeronautical Engineering
Test: III
Semester: VI
Subject Name & Code: GAS TURBINE TECHNOLOGY (18AE644)
Instructions
Date : 06-08-2021 **Duration: 90 Minutes** **Max Marks: 50**

NOTE: 1.Answer all five main questions, choosing one full question from each main

2. Missing data if any, can be suitably assumed

Question Number		Marks	CO	Levels
1	Explain compressor map for testing and performance evaluation	10	CO3	L-3
	OR			
2	Explain turbine map for testing and performance evaluation	10	CO3	L-3
3	Briefly explain RAM pressure recovery of inlets	10	CO3	L-2
	OR			
4	Briefly explain effect of inlet distortion in aircraft	10	CO3	L-2
5	With a neat sketch explain altitude test facility	10	CO4	L-2
	OR			
6	Briefly explain flying test bed used in testing of engines	10	CO4	L-2
7	Explain preliminary flight rating test & qualification test	10	CO4	L-2
	OR			
8	Explain acceptance test reliability test	10	CO4	L-2

9	Write a short note on i.Open air test bed ii.Ground testing of engine installed in aircrafts	10	CO4	L-2
	OR			
10	Write a short note on i.Jet thrust measurement in flight ii.CUSUM plat	10	CO4	L-2

COURSE OUTCOMES:

On successful completion of this course, students should be able to

CO1	**Describe** the types, applications, materials & Manufacturing Techniques and Parts used in various Gas Turbine engines.**(L2)**
CO2	**Apply** the principles of gas turbine technology to evaluate the performance of engines.**(L3)**
CO3	**Evaluate** the Testing and Performance parameters of different Components used in Gas turbine Engine.**(L3)**
CO4	**Describe** different types Engine Testing's used in Gas Turbine Engines .**(L2)**
CO5	**Develop** skills in doing Literature survey, Presentation and Report preparation for a given case study related to Gas turbine engines.**(L4)**

Internal Test Question paper

Name of the staff/s: CHANDRIKA M B

Date: 26/06/2021 Signature: Chandrika MB 26/6/21

Reviewer's Signature:

S.J.C. Institute of Technology
Department of Aeronautical Engineering
Test: II
Semester: VI
Subject Name & Code: GAS TURBINE TECHNOLOGY (18AE644)
Instructions
Date : 29-06-2021 **Duration: 90 Minutes** **Max Marks: 50**

NOTE: 1.Answer all five main questions, choosing one full question from each main

2. Missing data if any, can be suitably assumed

Question Number		Marks	CO	Levels
1	What is FADEC system? Explain FADEC interaction with engine	10	CO1	L-2
	OR			
2	Explain the typical oil systems and their components used in gas turbine Engines	10	CO1	L-2
3	Explain the typical Fuel systems and their components used in gas turbine Engines	10	CO1	L-2
	OR			
4	What are the different types of starting systems used in gas turbine engine and explain each	10	CO1	L-2
5	With a neat sketch explain the transient performance of a Aero gas turbine engine	10	CO2	L-2
	OR			
6	Explain the thrust engine start envelope oru starting process	10	CO2	L-2
7	Define Surge margin and explain Surge margin required and Surge margin stack up.	10	CO2	L-2
	OR			
8	Define windmilling and describe the process of windmill in a Turbojet engine	10	CO2	L-2

9	What are the different design point performance parameters used in gas turbine engines and Explain any two of them	10	CO2	L-2
	OR			
10	Briefly explain the engine performance monitoring process	10	CO2	L-2

COURSE OUTCOMES:

On successful completion of this course, students should be able to

CO1	**Describe** the types, applications, materials & Manufacturing Techniques and Parts used in various Gas Turbine engines.**(L2)**
CO2	**Apply** the principles of gas turbine technology to evaluate the performance of engines.**(L3)**
CO3	**Evaluate** the Testing and Performance parameters of different Components used in Gas turbine Engine.**(L3)**
CO4	**Describe** different types Engine Testing's used in Gas Turbine Engines .**(L2)**
CO5	**Develop** skills in doing Literature survey, Presentation and Report preparation for a given case study related to Gas turbine engines.**(L4)**

Internal Test Question paper

Name of the staff/s: CHANDRIKA M B Date: 26/05/2021 Signature: Chandrika M B 26/5/21

Reviewer's Signature:	

S.J.C. Institute of Technology
Department of Aeronautical Engineering
Test: I
Semester: VI
Subject Name & Code: GAS TURBINE TECHNOLOGY (18AE644)
Instructions
Date : 28-05-2021 **Duration: 90 Minutes** **Max Marks: 50**

NOTE: 1.Answer all five main questions, choosing one full question from each main

2. Missing data if any, can be suitably assumed

Question Number		Marks	CO	Levels
1	Briefly explain the working of turbojet engine and also mention the characteristics and advantages and disadvantages.	10	CO1	L-2
	OR			
2	Draw a neat sketch of a turboprop engine and mark the salient parts and explain its working principle along with advantages and disadvantages.	10	CO1	L-2
3	Explain the following i. thrust reversal method ii. thrust augmentation	10	CO1	L-2
	OR			
4	Explain the following i.sound separation techniques in Aircraft engine ii.convergent divergent nozzle	10	CO1	L-2
5	List different types of Compressors and explain any one type.	10	CO1	L-2

	OR			
6	What are the different types of burners used in gas turbine engines explain with sketches? Also mention the merits and demerits of each	10	CO1	L-2
7	What are the characteristics that must be considered in selection of any metal used in gas turbines?	10	CO1	L-2
	OR			
8	Write a short note on following i. Thermal shock resistance ii. High temperature strength iii. Resistance to corrosion and oxidation	10	CO1	L-2
9	Write in detail about the heat range of metals for Aero engine applications	10	CO1	L-2
	OR			
10	Write a short note on ceramics and composite materials in gas turbine applications.	10	CO1	L-2

COURSE OUTCOMES:

On successful completion of this course, students should be able to

CO1	**Describe** the types, applications, materials & Manufacturing Techniques and Parts used in various Gas Turbine engines.**(L2)**
CO2	**Apply** the principles of gas turbine technology to evaluate the performance of engines.**(L3)**
CO3	**Evaluate** the Testing and Performance parameters of different Components used in Gas turbine Engine.**(L3)**
CO4	**Describe** different types Engine Testing's used in Gas Turbine Engines .**(L2)**
CO5	**Develop** skills in doing Literature survey, Presentation and Report preparation for a given case study related to Gas turbine engines.**(L4)**

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Department of Aeronautical Engineering

TUTORIAL-3

SUBJECT TITLE	GAS TURBINE TECHNOLOGY		
SUBJECT TYPE	ELECTIVE		
SUBJECT CODE	18AE644		
ACADEMIC YEAR	2021 (EVEN SEMESTER)	BATCH	2018-2022
SCHEME	CBCS scheme (Effective from the academic year 2018 -2019)		
SEMESTER	6- Aeronautical		
FACULTY NAME and DESIGNATION	CHANDRIKA M B, Assistant Professor.		

SI No	Questions	CO	Levels
	MODULE - 4		
1	Briefly explain effect of inlet distortion in aircraft	CO3	L2
2	Explain compressor map for testing and performance evaluation	CO3	L3
3	Briefly explain flying test bed used in testing of engines	CO3	L2
4	Explain preliminary flight rating test & qualification test	CO3	L2
5	Explain turbine map for testing and performanceevaluation	CO3	L3
6	Briefly explain RAM pressure recovery of inlets	CO3	L2
	MODULE - 5		
7	Briefly explain flying test bed used in testing ofengines	CO4	L2
8	Explain preliminary flight rating test & qualification test	CO4	L2
9	Explain acceptance test reliability test	CO4	L2

10	Write a short note on i.Open air test bed ii.Ground testing of engine installed in aircrafts	CO4	L2
11	Write a short note on i.Jet thrust measurement in flight ii.CUSUM plat	CO4	L2

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TUTORIAL-2

SUBJECT TITLE	**GAS TURBINE TECHNOLOGY**		
SUBJECT TYPE	**ELECTIVE**		
SUBJECT CODE	**18AE644**		
ACADEMIC YEAR	**2021 (EVEN SEMESTER)**	**BATCH**	**2018-2022**
SCHEME	**CBCS scheme (Effective from the academic year 2018 -2019)**		
SEMESTER	**6- Aeronautical**		
FACULTY NAME and DESIGNATION	**CHANDRIKA M B, Assistant Professor.**		

SI No	Questions	CO	Levels
	MODULE - 2		
1	What is FADEC system? Explain FADEC interaction with engine	CO1	L2
2	Explain the typical oil systems and their components used in gasturbine Engines	CO1	L2
3	Explain the typical Fuel systems and their components used in gas turbine Engines	CO1	L2
4	What are the different types of starting systems used in gasturbine engine and explain each	CO1	L2
	MODULE - 3		
5	With a neat sketch explain the transient performance of a Aerogas turbine engine	CO2	L2
6	Define windmilling and describe the process of windmill in a Turbojet engine	CO2	L2

7	Define Surge margin and explain Surge margin required andSurge margin stack up.	CO2	L2
8	What are the different design point performance parameters used in gas turbine engines and Explain any two of them	CO2	L2
9	Explain the thrust engine start envelope are starting process	CO2	L2
10	Briefly explain the engine performance monitoring process	CO2	L2

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TUTORIAL-1

SUBJECT TITLE	GAS TURBINE TECHNOLOGY		
SUBJECT TYPE	ELECTIVE		
SUBJECT CODE	18AE644		
ACADEMIC YEAR	2021 (EVEN SEMESTER)	BATCH	2018-2022
SCHEME	CBCS scheme (Effective from the academic year 2018 -2019)		
SEMESTER	6- Aeronautical		
FACULTY NAME and DESIGNATION	CHANDRIKA M B, Assistant Professor.		

SI No	Questions	CO	Levels
	MODULE - 1		
1	Draw a neat sketch of a turboprop engine and mark the salient parts and explain its working principle along with advantages anddisadvantages.	CO1	L2
2	With a neat sketch explain the working of turbofan engine and also mention the characteristics and advantages and disadvantages	CO1	L2
3	Briefly explain the working of turbojet engine and also mentionthe characteristics and advantages and disadvantages	CO1	L2
4	What are the different types of burners used in gas turbine enginesexplain it with sketches write the merits and demerits of each	CO1	L2
5	List different types of Compressors and explain any one type.	CO1	L2
6	List and explain the effect of operating variables on burner performance	CO1	L2
7	What are the performance requirements of combustion chamber	CO1	L2

8	Explain the following i.sound separation techniques in Aircraft engine ii.convergent divergent nozzle iii. thrust reversal method iv. thrust augmentation	CO1	L2
	MODULE - 2		
9	Explain the criteria for selection of materials/ What are the characteristics that must be considered in selectionof any metal used in gas turbines?	CO1	L2
10	Write a short note on ceramics and composite materials in gasturbine applications.	CO1	L2
11	Write in detail about the heat range of metals for Aero engine applications	CO1	L2
12	Write a short note on following i. Thermal shock resistance ii. High temperature strength iii. Resistance to corrosion and oxidation	CO1	L2

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QUESTION BANK

SUBJECT TITLE	**GAS TURBINE TECHNOLOGY**		
SUBJECT TYPE	**ELECTIVE**		
SUBJECT CODE	**18AE644**		
ACADEMIC YEAR	**2021 (EVEN SEMESTER)**	**BATCH**	**2018-2022**
SCHEME	**CBCS scheme (Effective from the academic year 2018 -2019)**		
SEMESTER	**6- Aeronautical**		
FACULTY NAME and DESIGNATION	**CHANDRIKA M B, Assistant Prof.**		

Module -1			
Q. No.	*Questions*	*Bloom's LL*	*COs*
1	List different types of Compressors, Turbines and Combustion chambers.	L1	CO1
2	Draw a neat sketch of a turboprop engine and mark the salient parts and explain its working principle along with advantages and disadvantages	L2	CO1
3	With a neat sketch explain the working of turbofan engine and also mention the characteristics and advantages and disadvantages	L2	CO1
4	Briefly explain the working of turbojet engine and also mention the characteristics and advantages and disadvantages	L2	CO1
5	What are the different types of burners used in gas turbine engines explain it with sketches write the merits and demerits of each	L2	CO1
6	What are the performance requirements of combustion chamber	L2	CO1
7	Develop skills in doing Literature survey, Presentation and Report preparation for agiven case study related to Gas turbine engines	L4, L5&L6	CO5

Module -2			
Q. No.	*Questions*	*Bloom's LL*	*COs*
1	Define desirable properties of Materials.	L1	
2	Explain the criteria for selection of materials/ What are the characteristics that must be considered in selection of any metal used in gas turbines?	L2	
3	Write a short note on ceramics and composite materials in gas turbine applications	L2	
4	Write in detail about the heat range of metals for Aero engine applications	L2	
5	Write a short note on following i. Thermal shock resistance ii. High temperature strength iii. Resistance to corrosion and oxidation	L2	
6	What is FADEC system? Explain FADEC interaction with engine	L2	
7	Explain the typical oil systems and their components used in gas turbine Engines	L2	
8	Explain the typical Fuel systems and their components used in gas turbine Engines	L2	
9	What are the different types of starting systems used in gas turbine engine and explain each	L2	
10	Develop skills in doing Literature survey, Presentation and Report preparation for agiven case study related to Gas turbine engines	L4, L5&L6	

Module -3			
Q. No.	*Questions*	*Bloom's LL*	*COs*
1	With a neat sketch explain the transient performance of a Aero gas turbine engine	L1	
2	Define windmilling and describe the process of windmill in a Turbojet engine	L1	
3	Define Surge margin and explain Surge margin required and Surge margin stack up.	L1	
4	What are the different design point performance parameters used in gas	L2	

	turbine engines and Explain any two of them		
5	Explain the thrust engine start envelope are starting process	L2	
6	Briefly explain the engine performance monitoring process	L2	
7	Develop skills in doing Literature survey, Presentation and Report preparation for agiven case study related to Gas turbine engines	L4, L5&L6	

Module -4			
Q. No.	*Questions*	*Bloom's LL*	*COs*
1	Briefly explain effect of inlet distortion in aircraft	L2	
2	Briefly explain RAM pressure recovery of inlets	L2	
3	Explain compressor map for testing and performance evaluation	L3	
4	Explain turbine map for testing and performanceevaluation	L3	
5	Explain turbine rig set up for testing performance evaluation	L3	
6	Explain compressor rig set up for testing performance evaluation	L3	
7	Develop skills in doing Literature survey, Presentation and Report preparation for agiven case study related to Gas turbine engines	L4, L5&L6	

Module -5			
Q. No.	*Questions*	*Bloom's LL*	*COs*
1		L1	
2	Briefly explain flying test bed used in testing ofengines	L1	
3	Explain preliminary flight rating test & qualification test	L1	
4	Explain acceptance test reliability test	L2	
5	Write a short note on i.Open air test bed ii.Ground testing of engine installed in aircrafts	L2	
6	Write a short note on i.Jet thrust measurement in flight ii.CUSUM plat	L2	
7	Briefly explain flying test bed used in testing ofengines	L3	
8	Explain preliminary flight rating test & qualification test	L3	

9	Develop skills in doing Literature survey, Presentation and Report preparation for agiven case study related to Gas turbine engines	L4, L5&L6	

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Department of Aeronautical Engineering

ASSIGNMENT-3

SUBJECT TITLE	**GAS TURBINE TECHNOLOGY**		
SUBJECT TYPE	**ELECTIVE**		
SUBJECT CODE	**18AE644**		
ACADEMIC YEAR	**2021 (EVEN SEMESTER)**	**BATCH**	**2018-2022**
SCHEME	**CBCS scheme (Effective from the academic year 2018 -2019)**		
MARKS & DUE DATE	**10 Marks -**		
SEMESTER	**6- Aeronautical**		
FACULTY NAME and DESIGNATION	**CHANDRIKA M B, Assistant Professor.**		

Rubircs

Brief answer for each question with necessary diagrams	2M/question
Total Marks	10

Module -3			
Q. No.	*Questions*	*Bloom's LL*	*COs*
1	Explain what do you mean by compressor map for testing and performance evaluation	L3	CO3
2	Explain turbine mapping for testing and performance evaluation	L3	CO3
3	What is RAM pressure recovery how it is important in improving or decreasing the engine performance	L2	CO3
4	What is the effect of inlet distortion in an aircraft	L2	CO3
5	Explain the testing and performance evaluation of ducts	L3	CO3
6	The following are the test data obtained after an engine Run. Find the corrected value of the above is order that a valid comparison can be made RPM =9465 , EGT=510° C, fuel flow =1814 kg/h, air mass flow=90.7kg/s	L3	CO3

	thrust=4536 kg, TSFC= 0.400, barometric pressure=102.6kPa, standard day pressure =101.3 kPa. Ambient temperature =27.8° C, standard day temperature =15° C.		
7	Calculate surge for the following data: New production engine to engine working line variation =0 +/ - 1.5 % Engine to engine surge line variation for production engine =0. +/ - 4.0% In service working line deterioration= 2.0% In service surge line deterioration= 4.0% Control system fuel metering VIG v position etc= 0 +/ - 1.0 % Reynolds number effect =1.0% Intake distortion =1.0% Transient allowance= 12.0%	L3	CO3

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Department of Aeronautical Engineering
ASSIGNMENT-2

SUBJECT TITLE	GAS TURBINE TECHNOLOGY		
SUBJECT TYPE	ELECTIVE		
SUBJECT CODE	18AE644		
ACADEMIC YEAR	2021 (EVEN SEMESTER)	BATCH	2018-2022
SCHEME	CBCS scheme (Effective from the academic year 2018 -2019)		
MARKS & DUE DATE	10 Marks -		
SEMESTER	6- Aeronautical		
FACULTY NAME and DESIGNATION	CHANDRIKA M B, Assistant Professor.		

Rubircs

Brief answer for each question with necessary diagrams	2M/question
Total Marks	10

Module -4			
Q. No.	*Questions*	*Blooms LL*	*COs*
1	Write a short note on 1.open air test bed 2.ground testing of engine installed in aircraft 3.Jet thrust measurement in flight	L2	CO4
2	Explain qualification test accepted test reliability test	L2	CO4
3	The observed parameters can be gathered during an engine run are RPM , EGT, thrust and TSFC. what is the corrected values of the above values	L2	CO4
4	What are the engine parameters instrumented and recorded during the test of an engine	L2	CO4
5	Explain methods of displacing equilibrium tests	L2	CO4
6	List the proof of concepts used in the process of engine testing explain	L2	CO4

	preliminary flight rating test(PFRT) in detail		
7	Explain the following 1.uncertainty analysis in Engineering Test 2.MASS and CUSUM plots for engine testing	L2	CO4
8	What are the major factors that should be taken into account during the design of a test bed	L2	CO4
9	What is the flying test bed and what are the advantages	L2	CO4

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