

Reg.No. _____



Karunya UNIVERSITY

(Karunya Institute of Technology & Sciences)

(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

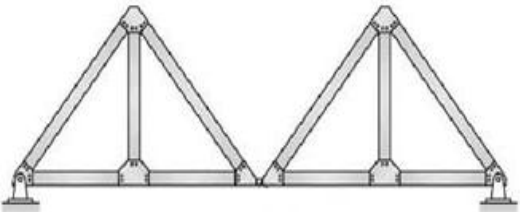
End Semester Examination – Nov/Dec – 2016

Code : 14AE2001
Sub. Name : Introduction to Aerospace Engineering

Semester : 2016-17 ODD
Duration : 3hrs
Max. marks : 100

Q. No.	Questions				Course outcome	Marks
PART-A (40X1=40 MULTIPLE CHOICE QUESTIONS)						
1.	Who is the father of modern aviation ?					
	a. Sir George Cayley	b. Otto Lilienthal	c. Octave Chanute	d. M. Herring	1	(1)
2.	Who build and flew the world’s first powered monoplane?				1	
	a. Glenn Curtiss	b. Louis Bleriot	c. Wright Brothers	d. Leonardo da Vinci		(1)
3.	When did Wright Brothers make the first successful flight?				1	
	a. 1900	b. 1903	c. 1965	d. 1898		(1)
4.	Who is the father of Modern Aviation?				1	
	a. Sir George Cayley	b. Otto Lilienthal	c. Octave Chanute	d. M. Herring		(1)
5.	What does ISA stand for?				1	
	a. International Standards Administration	b. International standered atmosphere	c. International Security Administration	d. None of these		(1)
6.	Which is the Hydrostatic Equation.				1	
	a. $dp = -gdh$	b. $dp = - \rho gdh$	c. $dp = -\rho g$	d. $dp = -\rho dh$		(1)
7.	What is absolute altitude.				1	
	a. Altitude measured from sea level	b. Altitude measured using temperature	c. Altitude measured using pressure	d. Altitude measured from center of the earth		(1)
8.	Which of the following statement is as the altitude increase in stratosphere of ISA				1	
	a. Temperature increase and dynamic viscosity decrease	b. Temperature remain constant and pressure increase	c. Temperature decrease and sound speed decrease	d. Temperature remain constant and density decrease		(1)
9.	What is the temperature at 11 km. Take lapse rate = - 0.0065 k/m and $T_0=288K$				1	
	a. 216.78K	b. 200K	c. 120K	d. 320K		(1)
10.	The rate at which temperature decreases with increasing altitude is known as the				1	
	a. Temperature slope	b. Lapse rate	c. sounding	d. Thermocline		(1)

11.	Aircraft Roll, pitch and yaw are controlled by				2	
	a. Slots Elevator Rudder	b. Aileron Elevator Rudder	c. Rudder Elevator Aileron	d. Elevator Rudder Aileron		(1)
12.	The cockpit is the				2	
	a. The front of the plane	b. The end of the plane	c. The fuselage compartment occupied by the pilots	d. The cargo part of the plane		(1)
13.	Consider an aeroplane flying at a pressure altitude of 9144 m ($P=0.3$ bar) and density altitude of 8686.8(0.485 kg/m^3) m. What is the outside air temperature. Take $R = 287 \text{ J/kg-K}$				1	
	a. 200K	b. 150K	c. 215.5K	d. 100K		(1)
14.	The Speed of the aircraft is 50 m/s, density of air is 1.22 kg/m^3 , lift coefficient is 0.95, wing area is 12.5 m ² . The lift of the wing is				1	
	a. 18000 N	b. 18109 N	c. 18050 N	d. 18900N		(1)
15.	Increasing the aspect ratio of a wing, will generally do				2	
	a. Increase zero lift angle of attack	b. Max. lift coefficient decreases	c. stalling angle of attack decrease	d. None of these		(1)
16.	The value of zero lift angle of attack for symmetric airfoil is				1	
	a. 1	b. -1	c. 0	d. None of these		(1)
17.	The purpose of spoiler is to					
	a. Increase lift	b. Minimize the lift	c. Increase the speed	d. Decrease the drag		(1)
18.	What is axis of the flight that control pitch				2	
	a. Lateral axis	b. Vertical Axis	c. Longitudinal axis	d. None of these		(1)
19.	The speed of the aircraft is 80 m/s, density of air is 1.0 kg/m^3 , drag coefficient is 0.1, wing area is 40 m ² . Find drag of the wing.				1	
	a. 3000 K	b. 2305 N	c. 12800 N	d. 13500 N		(1)
20.	For a symmetric airfoil the lift coefficient for zero degree angle of attack is				2	
	a. 1	b. 0	c. -1	d. None of these		(1)
21.	A perfect frame should satisfy the relation $m = \frac{m}{J}$ m = number of member J = number of joint				1	
	a. $2j-5$	b. $2j-3$	c. $j-3$	d. $2j-4$		(1)
22.	Longitudinal structural members of a semi monocoque fuselage are called				2	
	a. spars and ribs.	b. longerons and stringers	c. spars and stringers.	d. Ribs and longerons		(1)
23.	Stress is a				1	
	a. Vector	b. scalar	c. Tensor	d. None of these		(1)
24.	A truss as shown in figure having two pin supports . Truss is				2	

					
	a. Determinate	b. Indeterminate	c. None of these		(1)
25.	<p>A square steel rod 20 mm×20 mm in section is to carry an axial compressive load of 100KN . The shorting in a length of 50mm is</p> <p>Take $E = 2.14 \times 10^8 \text{ KN/m}^2$</p>			1	
	a. 0.484 mm	b. 0.584 mm	c. 0.0384 mm	d. 1.2 mm	(1)
26.	Where the aerodynamic compression process take place in turbojet engine			2	
	a. Diffuser	b. Compressor	c. Turbine	d. Combustion chamber	(1)
27.	Mach number is			1	
	a. Ratio of vehicle velocity and speed of sound	b. Ratio of vehicle velocity and exit gas velocity of the engine	c. Ratio of speed of sound and vehicle velocity	d. Ratio of speed of sound and exit gas velocity of the engine	(1)
28.	A large ducted fan is mounted on the shaft ahead of the compressor in jet engine is called			2	
	a. Turbojet engine	b. Turboprop engine	c. Turbofan engine	d. Rocket engine	(1)
29.	In an isentropic process			1	
	a. Heat transfer is zero	b. Work done is zero	c. Stagnation pressure is constant	d. Work done is irreversible	(1)
30.	The ratio of flight speed to the exhaust velocity for maximum propulsion efficiency is			1	
	a. 0	b. 1	c. 0.5	d. 2	(1)
31.	An low speed airplane flying at a velocity of 50 m/s at 2 km (temperature at 2 Km altitude is 280 K) altitude. The mach number of an airplane is			1	
	a. 0.15	b. 1.5	c. 0.9	d. 0.99	(1)
32.	Where is the aerodynamic compression process take place in turbojet engine			2	
	a. diffuser	b. turbine	c. compressor	d. combuston chamber	(1)
33.	What is the thermodynamic cycle of a turbojet engine.			1	
	a. Brayton cycle	b. Otto cycle	c. Diesel cycle	d. Ericsson cycle	(1)
34.	What turbine engine section provides for proper mixing of the fuel and air?			2	
	a. Compressor	b. Diffuser section	c. Turbine section	d. None of these	(1)

	section					
35.	What is unit of the specific impulse of rocket?				1	
	a. meters	b. Kelvin	c. Second	d. Newton		(1)
36.	A turbojet engine having a flight velocity of 1100 km/hr produce 14 kN of thrust and uses 40 kg of air per second . What is the exit jet velocity				1	
	a. 600 m/s	b. 655 m/s	c. 500 m/s	d. 555 m/s		(1)
37.	Efficiency of a rocket engine is expressed in terms of				1	
	a. Thrust specific fuel consumption	b. Joule	c. specific impulse	d. None of these		(1)
38.	Efficiency of a rocket engine is depend upon				1	
	a. Combustion Temperature (T_o)	b. Molecular weight of the propellant (M)	c. Both (T_o, M)	d. None of these		(1)
39.	Abbreviation of NACA				3	
	a. National Advisory Committee for Aeronautics	b. National Advisory Committee for Aerospace	c. National Advisory Committee for Aviation	d. National Advisory Committee for Aircraft		(1)
40.	A rocket has the following data: Propellant flow rate = 121.9 kg/s, Nozzle exit diameter = 0.95 m, Nozzle exit pressure = 1.218 bar, Ambient pressure = 1.218 bar, Thrust = 475000 N. What is the effective jet velocity				1	
	a. 3000 m/s	b. 3894 m/s	c. 2000 m/s	d. 2894 m/s		(1)

PART B(8 X 5 = 40 MARKS) (ANSWER ANY EIGHT)

41.	Explain the contributions of the Wright brothers.	1	(5)
42.	Define aspect ratio and explain the effect of aspect ratio on $c_l \alpha$ curve .	1	(5)
43.	What is Aileron? What is its use and how does it help in aircraft maneuver?	2	(5)
44.	Experiment were conducted in a wind tunnel with a wind speed 50 km /hr on a flat plate of size 2 m long and 1 m wide. The density of air is 1.15 kg/m^3 . The coefficient of lift and drag are 0.75 and 0.15 respectively. Determine i) Lift force ii) Drag force	1	(5)
45.	Explain the function of Pitot -Static system with neat sketch.	2	(5)
46.	What is airframe? Explain with example the primary and secondary aircraft structure.	2	(5)
47.	What is a sandwich structure and explain its advantages and disadvantages in aircraft structure.	2	(5)
48.	How a jet propulsion sytem works?		(5)
49.	Describe the achievements of India in the exploration of space.	3	(5)
50.	Derive the expression for specific impulse (I_{sp}) for a rocket engine in terms of the temperature of combustion chamber (T_o) and the molecular weight of the propellant..	1	(5)

PART C(2 X 10 = 20 MARKS) (ANSWER ANY TWO)

51.	Define standard atmosphere. Derive an expression for pressure and density ratio i) in the isothermal region of the standard atmosphere ii) in the gradient region of the standard atmosphere.	1	(10)
52.	Explain the major aircraft components and its functions.	2	(10)

53.	Consider a turbojet powered airplane flying at a standard altitude of 12000 m at a velocity of 650 km/h. The turbojet engine itself has inlet and exit areas of 0.50 and 0.42 m ² respectively. The velocity and pressure of the exhaust gas at the exit are 460 m/s and 0.25 bar respectively. Calculate the thrust of the turbojet. The standard sea level values are pressure = 101325 N/ m ² , density = 1.2256 Kg/m ³ and temperature = 288.16 K, lapse rate = -0.0065 K/m	1	(10)
-----	---	---	------

ALL THE BEST