Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_



**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**

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|  |  | **Semester :** | **2016-17 ODD** |
| **Code :** | **14AE2001** | **Duration :** | **3hrs** |
| **Sub. Name :** | **INTRODUCTION TO AEROSPACE ENGINEERING** | **Max. marks :** | **100** |

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| **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 | CO 1 | (1) |
| 2. | Who build and flew the world’s first powered monoplane? | | | | CO 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? | | | | CO 1 |  |
|  | a. 1900 | b. 1903 | c. 1965 | d. 1898 |  | (1) |
| 4. | Who is the father of Modern Aviation? | | | | CO 1 |  |
|  | a. Sir George Cayley | b.Otto Lilienthal | c. Octave Chanute | d. M. Herring |  | (1) |
| 5. | What does ISA stand for? | | | | CO 1 |  |
|  | a. International Standards Administration | b.International standered atmosphere | c. International  Security Administration | d.None of these |  | (1) |
| 6. | Which is the Hydrostatic Equation. | | | | CO 1 |  |
|  | a. dp = -gdh | b. dp = - ρgdh | c. dp = -ρg | d. dp = -ρdh |  | (1) |
| 7. | What is absolute altitude? | | | | CO 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? | | | | CO 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 To =288K | | | | CO 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 | | | | CO 1 |  |
|  | a. Temperature slope | b. Lapse rate | c. sounding | d. Thermocline |  | (1) |
| 11. | Aircraft Roll, pitch and yaw are controlled by | | | | CO 2 |  |
|  | a. Slots Elevator Rudder | b. Aileron Elevator Rudder | c. Rudder Elevator Aileron | d. Elevator Rudder Aileron |  | (1) |
| 12. | The cockpit is the | | | | CO 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 J/kg-K | | | | CO 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/m3 , lift coefficient is 0.95, wing area is 12.5 m2. The lift of the wing is | | | | CO 1 |  |
|  | a. 18000 N | b. 18109 N | c. 18050 N | d. 18900N |  | (1) |
| 15. | Increasing the aspect ratio of a wing , will generally do | | | | CO 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 | | | | CO 1 |  |
|  | a. 1 | b. -1 | c. 0 | d. None of these |  | (1) |
| 17. | The purpose of spoiler is to | | | | CO 1 |  |
|  | 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 | | | | CO 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/m3 , drag coefficient is 0.1, wing area is 40 m2. Find drag of the wing. | | | | CO 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 | | | | CO 2 |  |
|  | a. 1 | b. 0 | c. -1 | d. None of these |  | (1) |

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| 21. | A perfect frame should satisfy the relation m = \_\_\_\_\_\_\_\_\_\_  m= number of member  J = number of joint | | | | CO 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 | | | | CO 2 |  |
|  | a. spars and ribs. | b. longerons and stringers | c. spars and stringers. | d. Ribs and longerons |  | (1) |
| 23. | Stress is a | | | | CO 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 | | | | CO 2 |  |
|  | a. Determinate | b. Indeterminate | c. Both a & b | d. None of these |  | (1) |
| 25. | 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  Take E = 2.14×KN/ | | | | CO 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 | | | | CO 2 |  |
|  | a. Diffuser | b. Compressor | c. Turbine | d. Combustion chamber |  | (1) |
| 27. | Mach number is | | | | CO 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 | | | | CO 2 |  |
|  | a. Turbojet engine | b. Turboprop engine | c. Turbofan engine | d.Rocket engine |  | (1) |
| 29. | In an isentropic process | | | | CO 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 | | | | CO 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 | | | | CO 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 | | | | CO 2 |  |
|  | a. diffuser | b. turbine | c. compressor | d. combuston chamber |  | (1) |
| 33. | What is the thermodynamic cycle of a turbojet engine. | | | | CO 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? | | | | CO 2 |  |
|  | a. Compressor section | b. Diffuser section | c. Turbine section | d. None of these |  | (1) |
| 35. | What is unit of the specific impulse of rocket? | | | | CO 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? | | | | CO 1 |  |
|  | a. 600 m/s | b. 655 m/s | c. 500 m/s | d. 555 m/s |  | (1) |
| 37. | Effiency of a rocket engine is expressed in terms of | | | | CO 1 |  |
|  | a. Thrust specific fuel consumption | b. Joule | c. specific impulse | d.None of these |  | (1) |
| 38. | Effiency of a rocket engine is depend upon | | | | CO 1 |  |
|  | a. Combustion Temperature (To) | b. Molecular weight of the propellant (M) | c. Both (To,M) | d. None of these |  | (1) |
| 39. | Abbreviation of NACA | | | | CO 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 ? | | | | CO 1 |  |
|  | a. 3000 m/s | b. 3894 m/s | c.2000 m/s | d. 2894 m/s |  | (1) |

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| **PART B(8 X 5 = 40 MARKS) (ANSWER ANY EIGHT)** | | | |
| 41. | Explain the contributions of the Wright brothers. | CO 1 | (5) |
| 42. | Define aspect ratio and explain the effect of aspect ratio on cl-α curve. | CO 1 | (5) |
| 43. | What is Aileron? What is its use and how does it help in aircraft maneuver? | CO 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/m3. The coefficient of lift and drag are 0.75 and 0.15 respectively. Determine  i) Lift force  ii) Drag force | CO 1 | (5) |
| 45. | Explain the function of Pitot -Static system with neat sketch. | CO 2 | (5) |
| 46. | What is airframe? Explain with example the primary and secondary aircraft structure. | CO 2 | (5) |
| 47. | What is a sandwich structure and explain its advantages and disadvantages in aircraft structure. | CO 2 | (5) |
| 48. | How a jet propulsion sytem works? | CO 2 | (5) |
| 49. | Describe the achievements of India in the exploration of space. | CO 3 | (5) |
| 50. | Derive the expression for specific impulse (Isp) for a rocket engine in terms of the temperatureof combustion chamber (To) and the molecular weight of the propellant.. | CO 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. | CO 1 | (10) |
| 52. | Explain the major aircraft components and its functions. | CO 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 m2 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/ m2, density = 1.2256 Kg/m3  and temperature = 288.16 K, lapse rate = -0.0065 K/m | CO 1 | (10) |