G 1739 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2016

Eighth Semester

Branch : Mechanical Engineering

ME 010 804 L01—AEROSPACE ENGINEERING (Elective III) (ME)

(New Scheme—2010 Admission onwards)

[Regular/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

1. Write the energy equation for two dimensional compressible flow.
2. Define centre of pressure and aerodynamic centre.
3. What is the use of conical spike in a ramjet engine ?
4. List the high lift devices used in an aircraft.
5. Distinguish subsonic and supersonic wind tunnels.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. Explain the Pressure, temperature, density variations of air by using International standard atmosphere chart.
7. Explain the pressure distribution over an aerofoil with neat sketch.
8. Compare the working efficiency of Turbojet, Turbo fan and Ramjet engines.
9. How is the aircraft performance affected by weight and altitude during the level flight ?
10. Give the procedure to measure the true air speed by using air speed indicators.

(5 × 5 = 25 marks)

Turn over

Part C

Answer **all** *questions.*
Each full question carries 12 *marks.*

11. (a) Derive the Navier stokes equations for a three dimensional, unsteady, compressible and viscous flow with body and pressure forces.

    (b) Apply the Bernoulli's principle to simplify the Navier stoke equations of two dimension body.

Or

12. (a) How do the static, dynamic and stagnation pressure vary in the supersonic flow condition ?

    (b) Determine the temperature, pressure, density and velocity of sound at altitudes of 3000, 9000, 16000 meters. Assume starting properties at mean sea level.

13. In low- speed, incompressible flow, the following experimental data are, obtained for an NACA 4412 airfoil section at an angle of attack of 4° : $C_1 = 0.85$ and $C_{m.c/4} = -0.09$. Calculate the location of centre of pressure.

Or

14. Consider an NACA 2412 airfoil with a chord of 0.64 m in an airstream at standard sea level conditions. The free stream velocity is 70 m/s. The lift per unit span is 1254 N/m. Calculate the angle of attack and the drag per unit span.

15. Explain with the help of neat sketch the working of Turbo fan engine. Write down its advantages and limitations.

Or

16. What is blade element theory ? How can you calculate the performance of airscrew by using this theory ?

17. (a) Explain how an aeroplane can fly at a wide range of air speeds.

    (b) Explain the service ceiling and absolute ceiling.

Or

18. Derive the conditions for minimum drag and minimum power condition for a steady level flight.

19. An air plane climbs at 20° to the horizontal at 120 km/hr. If it weighs 600 kg and the drag force is 110 kg, find (i) the HP required in overcoming the drag (ii) the HP required in overcoming the force of gravity and (iii) the HP required for the climb.

Or

20. (a) Explain the phenomenon of geysering in liquid propellant rockets. When does it occur ? Explain your answer with neat sketches.

    (b) Explain the phenomenon propellant hammer in liquid propellant rocket engine with a neat sketch.

(5 × 12 = 60 marks)