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G 612

(Pages : 2)

Reg. No..............................

Name..................................

B.TECH. DEGREE EXAMINATION, MAY 2014

Seventh Semester

Branch : Mechanical Engineering

GAS DYNAMICS AND JET PROPULSION (M)

(Old Scheme—Prior to 2010 Admissions)

[Supplementary]

Time : Three Hours

Maximum : 100 Marks

Use of approved Gas tables and charts are permitted.

Part A

Answer **all** *questions.*
Each question carries 4 *marks.*

1. Differentiate between zone of action and zone of silence.
2. Define and explain sonic velocity.
3. Explain choking in isentropic flow.
4. Differentiate between stream thrust and impulse function.
5. What are the assumptions in deriving fanno flow equations through a constant area duct.
6. Explain how a Rayleigh line is drawn in h-s diagram.
7. Differentiate between soundwave and shock wave.
8. Explain shock strength.
9. Differentiate between shaft power cycle and jet-propulsion cycle.
10. What is meant by after burning. What is its effect ?

($10 \times 4 = 40$ marks)

Part B

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

11. Derive the integral form of momentum equation for a control volume.

Or

12. Derive an expression for the sonic speed.
13. Show isentropic and adiabatic expansion and compression process in nozzles and diffusers on enthalphy-entropy co-ordinates indicate the initial and final values of static and stagnation pressures and temperatures.

Or

Turn over

14. Air flowing in a duct has a velocity of 300 m/s. pressure 1-0 bar and temperature 290 K. Taking $r = 1.4$ and $R = 287$ J/kg K. determine (i) stagnation pressure and temperature ; (ii) velocity of sound in the dynamic and stagnation conditions ; (iii) stagnation pressure assuming constant density.

15. Air enters a circular duct of 15 cm diameter with a Mach number o.5, pressure 300 kN/m^2 and temperature 320 K. Average friction factor for the duct is 0.005. Assuming choked adiabatic flow with friction, determine

    (a) Length of duct.

    (b) Change in entropy.

    (c) Change in impulse function.

    (d) Loss in isentropic stagnation pressure.

Or

16. Derive expressions for pressure ratio, temperature ratio, and density ratio in Rayleigh line flow.

    Show that the Mach number at the maximum enthalphy point on the Rayleigh the is $1/r$.

17. Obtain an expressions for entropy change across a normal shock wave as a function of upstream Mach number.

Or

18. A convergent-divergent nozzle has an exit area thrice its throat area. A normal shock occurs in the diverging section of the nozzle. The ratio of static pressure at exit to the stagnation pressure at inlet is 0.4. Determine to Mach number and the area of the section where the shock occurs.

19. With a neat sketch, explain the working of a turbo prop engine.

Or

20. With neat sketch explain the working of liquid propellant rocket engine. What are its advantages and disadvantages ?

(5 × 12 = 60 marks)