A   Reg. No. :

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. In transonic flow Mach number is   CO1- R

   (a) $0.8<M<1.2$ (b) $0.8>M<1.2$ (c) $0.8<M<1.5$ (d) $0.9<M<1.2$

2. Identify the Mach number Formula   CO1- R

   (c = fluid velocity, a = velocity of sound)

   (a) $M = c/a$ (b) $M = a/c$ (c) $M = c*a$ (d) $M = a - c$

3. Rayleigh line flow is a flow in constant area duct   CO2- R

   (a) With friction but without heat transfer   (b) Without friction but with heat transfer

   (c) With both friction and heat transfer   (d) Without either friction or heat transfer

4. For Rayleigh flow which one is correct.   CO2- R

   (a) $T_{01} = T_{02}$ (b) $P_{01} = P_{02}$ (c) $P_1^* = P_2^*$ (d) None of these

5. For oblique shock, the downstream Mach number   CO3- R

   (a) Is always more than unity   (b) Is always less than unity

   (c) May be less or more than unity   (d) Can never be unity

6. Across a Normal shock   CO3- R

   (a) the entropy remains constant   (b) the pressure and temperature rise

   (c) the velocity and pressure decrease   (d) the density and temperature decrease

7. A turbo-prop is preferred to turbo-jet because   CO4- R

   (a) It can fly at high elevations   (b) It has high propulsive efficiency at high speeds

   (c) It can fly at super sonic speeds   (d) It has high power for take off

8. Which one is Air breathing Engines.   CO4- R

   (a) Rocket Engine   (b) Turbojet Engine

   (c) Ramjet Engine   (d) Both B & C

9. A rocket engine uses _____ for the combustion of its fuel.   CO5- R

   (a) Its own oxygen   (b) Compressed atmospheric air

   (c) Surrounding air   (d) None of these

10. A rocket engine uses _____ for the combustion of its fuel.   CO5- R

   (a) its own oxygen   (b) compressed atmospheric air

   (c) surrounding air   (d) none of these

PART – B (5 x 2= 10 Marks)

11. Define Mach cone.   CO1- R

12. Write the practical examples for Rayleigh flow.   CO2- R

13. Define strength of shock wave   CO3- R

14. Write about turbo jet.   CO4- R

15. List the different types of rockets   CO5- R

PART – C (5 x 16= 80Marks)

16. (a) An air jet at 400 K has sonic velocity. Determine the following   CO1- App   (16)
        1. Velocity of sound at stagnation condition
        2. Maximum velocity of jet
        3. Stagnation enthalpy
        4. Crocco number

                                        Or

    (b) A conical air diffuser has entry and exit diameters of 15cm and 30   CO1- App   (16)
        cm respectively. The pressure, temperature and velocity of air at
        entry are 0.69 bar, 340 K and 180 m/s respectively. Determine
        exit pressure and exit velocity. Assume isentropic flow, γ=1.4 and
        C_P=1.0 kJ/kgK.

17. (a) The pressure, temperature & Mach number of the gas at exit are   CO2- App   (16)
        2bar, 1200^0C and 0.7 respectively. The ratio of stagnation
        temperature at exit to entry is 3.85. Calculate (i) Mach number,
        pressure and temperature of the gas entry (ii) the heat supplied
        per kg of gas (iii) the maximum heat supplied. Take γ = 1.3,
        C_p =1.22 KJ/ kg K.

2

59702

Or

(b) A circular duct passes 8.25 kg/s of air at an exit Mach number of   CO2- App   (16)
0.5. The entry pressure and temperature are 3.5 bar and 38°C
respectively and co-efficient of friction is 0.005. If the Mach
number at entry is 0.15, determine
(i) Diameter of the duct
(ii) Length of the duct
(iii) Pressure and temperature at exit
(iv) Stagnation pressure loss

18. (a) A jet air at 270K and 0.7bar has an initial mach number of 1.9. If   CO3- App   (16)
it passes through a normal shock wave. Determine the following
for downstream of the shock wave Mach number and properties.

Or

(b) An oblique shock wave at an angle of $33°$ occurs at the leading   CO3- App   (16)
edge of a symmetrical wedge. Air has a Mach number of 2.1
upstream temperature of 300K and Upstream pressure of 11 bar.
Determine the following
1.Downstream Pressure
2.Downstream temperature
3.wedge angle
4.Downstream Mach number

19. (a) Describe the principle of operation of a turbojet engine with neat   CO4- U   (16)
sketch and state its advantages and disadvantages.

Or

(b) Explain with neat sketch with the principle of operation of a   CO4- U   (16)
ramjet engine and state its advantages and disadvantages.

20. (a) Explain with neat sketch the working of Liquid propellant rocket   CO5 U   (16)
engine with merits and demerits.

Or

(b) Explain the construction and working of Hybrid Propellant   CO5 U   (16)
Rocket Engine with neat illustration.

59702

59702