

Roll No.

3600

**B. Tech. 8th Semester (Mechanical Engg.)
Examination – May, 2023
GAS DYNAMICS AND JET PROPULSION**

Paper : PEC-ME-408-G

Time : Three hours]

[Maximum Marks : 75

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt *five* questions in all, selecting *one* question from each Unit. Question No. 1 is *compulsory*. All questions carry equal marks.

1. (a) Explain stagnation states. 2.5 × 6 = 15
- (b) Define compressible flow and choked flow.
- (c) Define non-isentropic flow.
- (d) Propulsive efficiency.
- (e) Enlist feeding system in rocket engine.
- (f) Subsonic and supersonic flow

SECTION - A

2. Derive an equation for isentropic flow of gas through nozzle and diffuser to find out stagnation and critical states. 15
3. A conical diffuser has entry and exit temperature of 15 cm and 30 cm respectively. The pressure, temperature and velocity of air at entry are 0.69 bar, 340 K and 180 m/s. Determine the exit pressure, exit velocity and force exerted on diffuser walls. Take $\gamma = 1.4$, $c_p = 1.00 \text{ KJ} - \text{kg} - \text{K}$ and assume isentropic flow. 15

SECTION - B

4. Discuss normal shock wave. Derive equation for static pressure ratio, temperature ratio and density ratio across the shock. 15
5. A gas ($\gamma = 1.3$) at $P_1 = 345 \text{ m bar}$, $T_1 = 350 \text{ K}$ and $M_1 = 1.5$ is to be isentropically expanded to 138 m bar. Determine deflection angle, final mach number and the temperature of gas. 15

SECTION - C

6. Discuss about ramjet engine, its components and operation also find ideal efficiency. 15
7. Discuss on power utilization of fuel in turbojet engine and find out propulsive, thermal and overall efficiency. 15

3800- (P-3)(Q-9)(23) (2)

SECTION - D

8. Explain liquid propellant rocket engine. Also discuss advantages and disadvantages of liquid propellant rocket engine. 15
9. Give a brief summary of rocket application. 15

3800- (P-3)(Q-9)(23) (3)