

# 22337

11819

**3 Hours / 70 Marks**

Seat No.

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- Instructions* –
- (1) All Questions are *Compulsory*.
  - (2) Answer each next main Question on a new page.
  - (3) Illustrate your answers with neat sketches wherever necessary.
  - (4) Assume suitable data, if necessary.
  - (5) Use of Non-programmable Electronic Pocket Calculator is permissible.
  - (6) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.
  - (7) Use of Steam tables, logarithmic, Mollier's chart is permitted.

**Marks**

1. Attempt any FIVE of the following: **10**
- a) Define gray body.
  - b) State the function of :
    - (i) Fusible plug and
    - (ii) Economiser
  - c) Define:
    - (i) Boiler efficiency
    - (ii) Latent heat
  - d) State Dalton's law of partial pressure.

P.T.O.

- e) Explain choked flow condition in nozzle.
- f) What is universal gas constant?
- g) Define:
  - (i) Flow work
  - (ii) Entropy

**2. Attempt any THREE of the following: 12**

- a) Represent the following processes on P-V and T-S diagram.
  - (i) Isentropic process
  - (ii) Isobaric process
- b) Define irreversible process. State the factors making process irreversible.
- c) In a steam power cycle, the steam supply is at 15 bar and dry and saturated. The condenser pressure is 0.4 bar. Determine dryness fraction and enthalpy of steam.
- d) How steam turbines are classified?

**3. Attempt any THREE of the following: 12**

- a) Using the mollier chart, find the heat drop and final condition of steam when the steam from an initial pressure of 30 bar and temperature 350°C is expanded adiabatically to a pressure of 1 bar.
- b) State steady flow energy equation and apply it to condenser with block diagram.
- c) 3 m<sup>3</sup> of gas at 30°C and 5 bar pressure is expanded isothermally to 1 bar with law  $PV = C$ . Find work done, change in internal energy and heat transferred.
- d) State the main features of Indian boiler regulations. (IBR)

- 4. Attempt any THREE of the following:** **12**
- a) A cylinder contains  $0.12 \text{ m}^3$  of air at 1 bar and  $90^\circ\text{C}$ . It is compressed to  $0.03 \text{ m}^3$ , the final pressure being 6 bar. Find the index of compression and increase in internal energy.
  - b) Explain different losses in steam turbine.
  - c) State:
    - (i) Fourier's law
    - (ii) Newton's law of cooling
    - (iii) Radiation and
    - (iv) Thermal conductivity
  - d) State the advantages of regenerative feed heating.
  - e) A balloon of spherical shape, 10 m in diameter is filled with  $\text{H}_2$  at  $20^\circ\text{C}$  and atm. pressure. The surrounding air is at  $15^\circ\text{C}$  and barometer reads 75 mm of Hg. Determine the load lifting capacity of the balloon.
- 5. Attempt any TWO of the following:** **12**
- a) (i) Define throttling and state the purposes of it.  
(ii) Steam at a 6.87 bar,  $205^\circ\text{C}$ , enters in an insulated nozzle with velocity of 50 m/s. It leaves at a pressure of 1.37 bar and a velocity of 500 m/s. Determine the final enthalpy.
  - b) Explain with neat sketch, construction and working of impulse turbine.
  - c) Explain with neat sketch. Construction and working of plate type heat exchanger. State its applications.
- 6. Attempt any TWO of the following:** **12**
- a) Explain with neat sketch induced draught cooling tower.
  - b) Explain with neat sketch. Construction and working of Loeffler boiler.
  - c) (i) State the sources of air leakage in condenser.  
(ii) Steam enters a condenser at  $36^\circ\text{C}$  and with barometer reading 760 mm. If the vacuum of 695 mm is produced, find the vacuum efficiency.
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