

22337

23124

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 answer with neat sketches wherever necessary.
  - (4) Figures to the right indicate full marks.
  - (5) Assume suitable data, if necessary.
  - (6) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

**Marks**

1. **Attempt any FIVE of the following:** **10**
- a) Define intensive property and extensive property.
  - b) Differentiate between Heat and work. (Any two points)
  - c) State Avogadro's law.
  - d) Define Wet steam and dry steam.
  - e) Define Mach number and critical pressure.
  - f) State the functions of condenser.
  - g) Define Fourier's law of thermal conduction.

P.T.O.

2. **Attempt any THREE of the following:** **12**
- Explain Zeroth law of thermodynamics. Give one example.
  - Represent isochoric and isothermal process on P-V and T-S diagram.
  - Give classification of Boilers.
  - Explain with neat sketch working of evaporative condenser.
3. **Attempt any THREE of the following:** **12**
- 3 m<sup>3</sup> of gas of 30°C and 6 bar pressure is expanded isothermally to 1 bar. Find work done, change in internal energy and heat transferred during the process.
  - Differentiate between fire tube boiler and water tube boiler.
  - Differentiate between impulse turbine and reaction turbine.
  - Explain with neat sketch working of natural draught cooling tower.
4. **Attempt any THREE of the following:** **12**
- Write steady flow energy equation and apply it to Nozzle and Boiler.
  - Derive characteristics gas equation for perfect gas.
  - 0.44 kg of gas having volume 0.28 m<sup>3</sup> and pressure of 1.4 bar is compressed to a pressure of 14 bar according to  $PV^{1.3} = C$ . Find the change in internal energy.  
Take  $C_p = 1.041$  kJ/kgK and  $C_v = 0.743$  kJ/kgk.
  - Explain with neat sketch working of air preheater.
  - Suggest type of heat exchanger for following applications –
    - Dairy Plant (Milk chilling plant)
    - Condenser of house hold refrigeration system.Justify your answer.

**5. Attempt any TWO of the following: 12**

- a) Explain with neat sketch construction and working of Babcock and Wilcox Boiler.
- b) State necessity of compounding of steam turbine. Explain with neat sketch velocity compounding.
- c) For steam power plant having capacity 500 MW a cooling tower is required to set up with condenser. Suggest the type of condenser and cooling tower with justification.

**6. Attempt any TWO of the following: 12**

- a) Explain with neat sketch Regenerative feed heating and state any two advantages.
- b) Define Governing. Explain any one method of governing with neat sketch.
- c) A composite wall is made up of 0.2 m thick fire clay brick, faced with 0.1 m thick insulation. If temperature of inner and outer surfaces are 870°C and 210°C respectively. Calculate heat flow rate per unit area. Also find interface temperature.

Take –

$$K_{\text{brick}} = 1.039 \text{ W/m}^{\circ}\text{k}$$

$$K_{\text{insulation}} = 0.228 \text{ W/m}^{\circ}\text{k}$$

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