

# 17407

16117

**3 Hours / 100 Marks**

Seat No.

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- Instructions* –
- (1) All Questions are *Compulsory*.
  - (2) Illustrate your answers with neat sketches wherever necessary.
  - (3) Figures to the right indicate full marks.
  - (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.

**Marks**

1. a) **Attempt any SIX of the following:** **12**
- (i) What is isentropic process? Plot it on P-V diagram?
  - (ii) State why multistaging is necessary in air-compressor.
  - (iii) List out merits of liquid fuels over gaseous fuels.
  - (iv) Define piston displacement related to air compressor.
  - (v) Define wet steam and superheated steam.
  - (vi) List out applications of gas turbine.
  - (vii) State disadvantages of conventional energy sources.
  - (viii) What is calorific value of fuel? Define high calorific value.
- b) **Attempt any TWO of the following:** **8**
- (i) Represent isobaric and isochoric, process on P-V and T-S diagram.
  - (ii) Describe the different phases of formation of steam.
  - (iii) Explain working of turbo-prop engine.

P.T.O.

**2. Attempt any FOUR of the following:****16**

- a) Draw neat and labelled sketch of La-mont boiler.
- b) Draw P-V and T-S diagram of Brayton cycle and mention each process in it.
- c) Define the following:
  - (i) Dryness fraction
  - (ii) Degree of superheat
  - (iii) Sensible heat
  - (iv) Latent heat
- d) Calculate the enthalpy of 1 kg of steam at a pressure of 8 bar and dryness fraction of 0.8. How much heat would be required to raise 2 kg of this steam from water at 20°C? Assume  $P = 8$  bar,  $h_f = 720.9$  kJ/kg,  $h_{fg} = 2046.5$  kJ/kg.
- e) Explain different modes of heat transfer.
- f) Represent otto cycle and diesel cycle on P-V and T-S diagram and write equation for air standard efficiency of otto cycle.

**3. Attempt any FOUR of the following:****16**

- a) Explain working of turbojet engine.
- b) State classification of air compressor.
- c) Explain working of nuclear power plant with simple diagram.
- d) Explain working of tidal power plant with suitable sketch.
- e) Explain ultimate and proximate analysis of coal.
- f) A coal has following composition by mass:  
 $C = 85\%$ ,  $H_2 = 4\%$ ,  $S = 1\%$ ,  $O_2 = 2\%$  and  $N_2 = 1\%$  and remaining is ash. Find HCV and LCV of fuel.

- 4. Attempt any TWO of the following:** **16**
- a) Attempt the following:
    - (i) Explain working of Geothermal Power Plant with the help of neat sketch.
    - (ii) Explain construction and working of Bomb calorimeter.
  - b) Derive relation between P V and T for an adiabatic process.
  - c) Explain the construction and working of:
    - (i) Centrifugal compressor.
    - (ii) Axial flow compressor.
- 5. Attempt any TWO of the following:** **16**
- a) Attempt the following:
    - (i) Write the construction and working of two pass down flow surface condenser.
    - (ii) Explain function and location of condenser in steam power plant.
  - b) Differentiate between reciprocating and rotary air compressor.
  - c) During a boiler trial coal analysis on mass basis was reported as C = 62.4%, H<sub>2</sub> = 4.2%, O<sub>2</sub> = 4.5% moisture 15% and ash 13.9% Calculate minimum air required to burn 1 kg of coal. Also calculate higher and lower calorific value.
- 6. Attempt any FOUR of the following:** **16**
- a) What are applications of heat transfer in automobile?
  - b) Explain the sources of air leakages in condenser.
  - c) State need of inter cooling in air compressor with suitable sketch.
  - d) Compare closed cycle gas turbine and open cycle gas turbine.
  - e) Discuss solar energy as non-conventional energy source.
  - f) Discuss CNG and LPG as gaseous fuels.
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