

22441

21819

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) Figures to the right indicate full marks.
 - (5) Assume suitable data, if necessary.
 - (6) Use of Non-programmable Electronic Pocket Calculator is permissible.
 - (7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.
 - (8) Use of steam tables, logarithmic, Mollier's chart is permitted.

Marks

- 1. Attempt any FIVE of the following:** **10**
- a) Differentiate between open and close system.
 - b) Write equation for:
 - (i) Change in internal energy.
 - (ii) Work donefor polytrophic process.
 - c) State four properties of liquid fuel.
 - d) Define:
 - (i) Dryness fraction.
 - (ii) Degree of superheat.

P.T.O.

- e) State two advantages of multistage compression.
- f) Define renewable energy. Give two examples.
- g) State two limitations of solar energy.

2. Attempt any THREE of the following

12

- a) Classify steam turbine on the basis of:
 - (i) Principle of action
 - (ii) Direction of steam flow.
 - (iii) Method of governing.
 - (iv) Steam pressure.
- b) Draw dual cycle on P-V and T-S diagram and write the processes involved in it.
- c) Classify the steam boiler on the basis of
 - (i) Content in the tubes
 - (ii) Circulation of water and steam
 - (iii) According to boiler use.
 - (iv) According to axis of shell.
- d) Compare rotary and reciprocating air compressor on the basis of following points:
 - (i) Suitability at low and high discharge
 - (ii) Requirement of receiver
 - (iii) Balancing problem
 - (iv) Lubrication requirements

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

- a) Draw P-V and T-S diagram of Otto cycle and write its equation for thermal efficiency with its significance.
- b) A coal has following composition by mass:
82% C, H₂ = 5%, S = 1.5%, O₂ = 2.4, N₂ = 1% and remaining is ash. Find HCV and LCV of fuel.
- c) Suggest energy conservation techniques to be used in automobile workshop.
- d) Two kg of gas at 50°C is heated at constant volume until pressure is doubled. Determine.
 - (i) Final temperature
 - (ii) Change in internal energyTake $C_v = 0.70 \text{ kJ/kgK}$.

4. Attempt any THREE of the following **12**

- a) Explain the following terms with examples.
 - (i) Conduction
 - (ii) Convection
 - (iii) Radiation
- b) Describe with neat sketch working of Bomb calorimeter.
- c) Sketch energy flow diagram for steam boiler.
- d) State the factors governing the selection of cogeneration system write the advantages of cogeneration.
- e) State the various factors affecting volumetric efficiency of air compressor.

- 5. Attempt any TWO of the following.** **12**
- a) Describe ultimate analysis and proximate analysis of solid fuels.
 - b) Describe with neat sketch the construction and working of surface condenser.
 - c) Describe government policy (MNRE) for harnessing the potential power of renewable energy sources.
- 6. Attempt any TWO of the following** **12**
- a) Calculate the enthalpy of 1 kg of steam at a pressure of 7 bar and dryness fraction 0.8. How much heat would be required to generate 2kg of this steam from water at 30°C. Take Sp. heat of water $C_{pw} = 4.187 \text{ kJ/Kg K}$ $h_f = 697.20 \text{ kJ/kg}$, $h_{fg} = 2066.3 \text{ kJ/kg}$.
 - b) Describe with neat sketch working of air compressor used in automobile workshops. State its two advantages.
 - c) State two strengths and two limitations of following power plants in relation to human aspects of environment-
 - (i) Solar power plant
 - (ii) Geo-thermal power plant
 - (iii) Biomass power plant.
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