

17407

15116

3 Hours / 100 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) 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. a) Attempt any SIX of the following:** **12**
- (i) Plot P-V and T-S diagrams for Isochoric process.
 - (ii) Define - Sensible heat and Latent heat.
 - (iii) Define - overall isothermal efficiency of air compressor. Give mathematical expression for it.
 - (iv) State two applications of compressed air in automobile workshop.
 - (v) Draw P-V diagram of Brayton cycle.
 - (vi) List two conventional and two non-conventional sources of energy.
 - (vii) What is meant by calorific value of fuel? State its unit.
 - (viii) State function of condenser in steam power plant.

P.T.O.

b) Attempt any TWO of the following:

- (i) Represent the diesel cycle on P-V and T-S diagram. Define cut-off ratio and compression ratio.
- (ii) Draw a neat labelled sketch of three pass packaged type boiler.
- (iii) Describe working of turboprop engine.

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

- a) Represent dual cycle on P-V and T-S diagram and clearly indicate the processes in it.
- b) Explain conduction and convection with suitable examples.
- c) Describe phases of steam formation.
- d) Describe construction and working of La-mont boiler.
- e) What are the factors affecting volumetric efficiency of air compressor?
- f) Differentiate between open and closed cycle gas turbines.

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

- a) Explain working principle of single stage reciprocating air compressor.
- b) Give classification of gas turbines.
- c) Draw a neat sketch of thermal power plant.
- d) Describe working of wind mill.
- e) Write four advantages of liquid fuels over gaseous fuels used in boilers.
- f) A coal has the following composition by mass - carbon - 80 %, Hydrogen - 5%, Oxygen - 6%, Nitrogen - 2.5%, Sulphur - 1.5% and 5% ash. Calculate HCV and LCV per kg of fuel.

- 4. Attempt any TWO of the following:** **16**
- a) Describe with neat sketch construction and working of Nuclear Power Plant.
 - b) Describe the combustion chemistry of Carbon, Hydrogen and Methane.
 - c) (i) Describe concept of Tidal Power Plant.
(ii) Describe with sketch working of Bomb calorimeter.
- 5. Attempt any TWO of the following:** **16**
- a) Derive the relation between P, V and T for adiabatic process.
 - b) Draw a neat sketch of two pass down flow type surface condenser. Describe its construction and working.
 - c) Describe with neat sketch construction and working of centrifugal compressor. State its four advantages.
- 6. Attempt any FOUR of the following:** **16**
- a) State equations for air standard efficiency of otto and diesel cycle. Write meaning of terms involved.
 - b) 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 3 kg of this steam from water at 20°C?
Take Sp. heat of water = 4.2 kJ/kgK,
 $h_F = 720.9$ kJ/kg, $h_{Fg} = 2046.5$ kJ/kg
 - c) What is meant by multi-staging in compressor? Write its advantages. (any two)
 - d) Describe working of turbojet engine.
 - e) Describe with sketch construction and working of open cycle gas turbine.
 - f) Compare centrifugal compressor with axial flow compressor. (any four points)
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