

22441

21222

3 Hours / 70 Marks

Seat No.

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15 minutes extra for each hour

- 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) Preferably, write the answers in sequential order.

Marks

1. **Attempt any FIVE of the following:** **10**
- a) List different types of thermodynamic systems.
- b) Draw P-V diagram of Diesel Cycle.
- c) State advantages of liquid fuel over solid fuel.
- d) Define :
- i) Dryness fraction
- ii) Degree of superheat
- e) Define :
- i) Indicated power
- ii) Volumetric efficiency
- f) List different non conventional energy sources.
- g) State the advantages of Bio-mass power.
- h) Draw a neat sketch of Reciprocating Compressor.

P.T.O.

2. Attempt any THREE of the following: 12

- a) Write classification of steam boilers.
- b) Sketch P-V and T-S diagram of isobaric process and isentropic process.
- c) Compare impulse turbine and reaction turbine on the basis of
 - i) Pressure drop
 - ii) Blade speed and steam speed
 - iii) Frictional losses
 - iv) Power capacity
- d) Classify the air compressor on the basis of
 - i) Displacement
 - ii) According to motion
 - iii) Number of stages
 - iv) Capacity of compressor

3. Attempt any THREE of the following: 12

- a) Explain otto cycle with P-V and T-S diagram and write its equation for thermal efficiency with its significance.
- b) A sample of coal has the following composition on the mass basis : carbon 82%, hydrogen 8%, sulphur 2%, oxygen 4% and ash 4%. Calculate using Dulong's formula higher and lower calorific value of fuel.
- c) Suggest energy conservation techniques used in refrigeration.
- d) A gas has volume of 0.16m^3 , pressure 2 bar and temperature 100°C . If gas is compressed at constant pressure until its volume becomes 0.112m^3 . Determine temperature at the end of compression.

- 4. Attempt any THREE of the following:** **12**
- a) Explain application of conduction and convection mode of heat transfer in Automobiles.
 - b) Describe with neat sketch working of Bomb calorimeter.
 - c) Sketch energy flow diagram for steam boiler.
 - d) Describe with neat sketch working of two stage reciprocating air compressor with P-V diagram.
 - e) Explain co-generation system on the basis of sequence of energy use.
- 5. Attempt any TWO of the following:** **12**
- a) Describe ultimate analysis and proximate analysis of solid fuels.
 - b) Draw a neat sketch of surface condenser and write four applications 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) Compare centrifugal and axial compressor on the basis of
 - i) Working principle
 - ii) Capacity
 - iii) Nature of flow
 - iv) Application
 - v) Maintenance
 - vi) Delivery pressure range

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[4]

Marks

- b) 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 2 kg of this steam from water at 30°C. Take sp. heat of water $C_{PW} = 4.187$ KJ/kg K, $h_f = 697.20$ KJ/kg, $h_{fg} = 2066.3$ KJ/kg.
- c) Explain the construction and working of electricity generation through photovoltaic system.
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