

17407

11819

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 steam tables, logarithmic, Mollier's chart is permitted.

Marks

1. (A) Attempt any SIX :

12

- (a) Draw P-V and T-S diagram for isochoric process.
- (b) Define sensible heat and latent heat.
- (c) Define isothermal efficiency of compressor.
- (d) State the uses of compressed air.
- (e) State classification of gas turbines.
- (f) Enlist non-conventional energy sources.
- (g) List out merits of liquid fuel over solid fuel.
- (h) State two advantages and disadvantages of L.P.G.

(B) Attempt any TWO :

8

- (a) State formulae for air standard efficiency of Otto cycle and Diesel cycle.
Compare efficiency for same pressure ration and same conditions.
Comment.
- (b) Draw a neat labelled sketch of three pass packaged type boiler.
- (c) Explain working of turboprop engine.

2. Attempt any FOUR :**16**

- (a) Explain with P-V and T-S diagram of diesel cycle.
- (b) Explain process of heat transfer in automobiles.
- (c) Draw neat labelled sketch of 'La-Mont Boiler..
- (d) Describe phases of steam formation.
- (e) State the factors affecting volumetric efficiency of air compressor.
- (f) Differentiate between open cycle and closed cycle gas turbine.

3. Attempt any FOUR :**16**

- (a) Explain working of single stage reciprocating air compressor.
- (b) Draw Brayton cycle on P-V and T-S diagram.
- (c) Sketch with neat labels, the gas turbine power plant.
- (d) Explain the importance of non-conventional power generation system in the present situation of power shortage throughout the world.
- (e) Compare ultimate analysis and proximate analysis of solid fuels.
- (f) A sample of coal has following composition of mass Carbon = 61%, Hydrogen = 10%, Oxygen = 14%, Nitrogen = 4.5%, Sulphur = 3.5% and remainder is ash. Calculate higher and lower calorific value of coal per kg.

4. Attempt any TWO :**16**

- (a) Compare conventional and non-conventional energy sources. (min. 8 points)
- (b) Describe the combustion chemistry of carbon, hydrogen and methane.
- (c)
 - (i) Explain Geothermal power plant.
 - (ii) Explain H.C.V. and L.C.V. of fuels.

5. Attempt any TWO :**16**

- (a) Derive the relation between P, V & 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 screw compressor. State its advantages.

6. Attempt any FOUR :**16**

- (a) State the equation for Air standard efficiency for Carnot cycle and show it on P-V & T-S chart. State one reason why this cycle is not practical.
 - (b) A steam engine obtains steam from a boiler at a pressure of 15 bar and 0.98 dry. It was observed that the steam loses 21 kJ of heat per kg as it flows through the pipe line pressure remaining constant. Calculate dryness fraction of steam at the engine end of the pipeline.

(From steam table $P = 15$ bar, $h_g = 844.6$ kJ/kg and $h_{fg} = 1945.3$ kJ/kg)
 - (c) State necessity of multistaging and Intercooling of air compressor.
 - (d) Explain construction and working of turbojet engine.
 - (e) Explain the construction and working of open cycle gas turbine.
 - (f) Compare centrifugal and axial flow compressor.
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