

17407

21718

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.

Marks

1. (A) Attempt any SIX of the following :

12

- (a) What is an isochoric process ? Plot it on P-V diagram.
- (b) Define :
 - (i) Sensible Heat
 - (ii) Latent Heat
- (c) Define free air delivered and piston displacement related to air compressor.
- (d) State the application of compressed air.
- (e) Draw dual combustion cycle on P-V and T-S diagram.
- (f) Define conventional and non-conventional energy sources.
- (g) Define calorific value of fuel.
- (h) List the properties of fuel. (Any four)

(B) Attempt any TWO of the following :

8

- (a) Draw Isobaric and Isothermal process on P-V and T-S diagram.
- (b) Describe the different phases of formation of steam.
- (c) Explain the working principle of Turbojet engine, with a neat sketch.

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

- (a) Represent the diesel cycle on P-V and T-S diagram and write equation for air standard efficiency of the same.
- (b) Explain different types of modes of heat transfer.
- (c) Explain construction and working of three pass packaged type boiler.
- (d) Draw labelled diagram of La-Mont boiler.
- (e) Define following :
 - (i) Capacity of compressor
 - (ii) Volumetric efficiency
 - (iii) Isothermal efficiency
 - (iv) Brake power
- (f) Identify and write the application of gas turbine in aviation industry.

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

- (a) Explain construction and working of Axial flow compressor.
- (b) Explain Brayton cycle with P-V and T-S diagram. Also write equation of thermal efficiency for the same.
- (c) Explain working of nuclear power plant with simple diagram.
- (d) List parameter for the site selection of Nuclear Power Plant.
- (e) State four properties of fuel.
- (f) A coal has the following combination by mass C = 90%, H₂ = 3%, S = 1%, O₂ = 2%, N₂ = 2% and remaining is ash. Find HCV and LCV of the fuel.

4. Attempt any TWO of the following :**16**

- (a) Draw a neat layout of 'Thermal Power Plant'. List the components. Explain the working of thermal power plant.
- (b) Define calorific value of fuel. Differentiate between HCV and LCV of fuel. Also state which value is used in calculation and why.
- (c) Derive the relationship between P, V and T during adiabatic process.

5. Attempt any TWO of the following :**16**

- (a) (i) What are the various sources of air leakage into a steam condenser ?
How does it affect the performance of the condensing plant ?
- (ii) Explain function and location of condenser in steam power plant.
- (b) A two stage, single acting reciprocating air compressor takes in air at the rate of 5 kg/min. Intake pressure and temperature are 1 bar and 15 °C. The air is compressed to a final pressure of 15 bar. The intermediate pressure is ideal and intercooling is perfect. Take $n = 1.3$. Neglect the clearance and determine
 - (i) Intermediate stage pressure
 - (ii) Power required to drive the compressor
 - (iii) Isothermal efficiencyTake $R = 0.287 \text{ kJ/kg } ^\circ\text{K}$ for air
- (c) Explain with schematic diagram, working of,
 - (i) Open cycle gas turbine
 - (ii) Closed cycle gas turbine

P.T.O.

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

- (a) Calculate the air standard efficiency of an engine working on otto cycle. The bore and stroke of the cylinder are 17 cm and 30 cm respectively. The clearance volume is 0.002 m^3 . Take $\gamma = 1.4$ for air.
 - (b) Steam enters in engine at a pressure of 12 bar with a 67°C of superheat. It is exhausted at a pressure of 0.15 bar and 0.95 dry. Find drop in enthalpy of the steam.
 - (c) Explain construction and working of Rock drill using compressed air.
 - (d) Explain working principle of Turboprop engine, with a neat sketch.
 - (e) Compare : Ultimate analysis and Proximate analysis.
 - (f) Explain the working principle of Tidal power plant with neat sketch.
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