

# 17407

**21415**

**3 Hours / 100 Marks**

Seat No.

--	--	--	--	--	--	--	--

- 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**
- (i) Define:
    - 1) Sensible heat
    - 2) Latent heat
  - (ii) Draw P-V diagram of dual construction cycle.
  - (iii) Write formula for work done in polytropic process and write meaning of terms.
  - (iv) State function of steam condenser and its location in Steam Power Plant.
  - (v) Write two applications of compressed air.
  - (vi) What is meant by conventional and non-conventional source of energy?
  - (vii) Define - calorific value of fuel.
  - (viii) What is combustion?

P.T.O.

b) **Attempt any TWO of the following:****8**

- (i) What are the modes of heat transfer? Explain with suitable examples.
- (ii) Represent otto cycle on P-V and T-S diagram and write equation for air standard efficiency.
- (iii) With sketch explain working of Lamont boiler.

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

- a) Represent following thermodynamic processes on P-V and T-S diagram:
  - (i) Isobaric process
  - (ii) Isochoric process
  - (iii) Isothermal process
  - (iv) Adiabatic process
- b) State and explain different phases in formation of steam.
- c) Explain working of three pass packaged type boiler.
- d) Draw a neat sketch of two pass down flow surface condenser.
- e) What are the sources of air leakage in condenser?
- f) Compare centrifugal compressor with axial flow compressors.

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

- a) Explain construction and working of screw compressor.
- b) State necessity of multistaging and intercooling of air compressor.
- c) Define the following terms in relation to air compressor:
  - (i) I.P.
  - (ii) B.P.
  - (iii) Volumetric efficiency
  - (iv) Compressor efficiency
- d) Explain working of turboprop engine.
- e) Explain brayton cycle with the help of P-V diagram.
- f) State four properties of fuels.

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

- a) For an adiabatic process, derive relation between P, V and T.
- b) Explain with schematic diagram, working of:
  - (i) Open cycle gas turbine
  - (ii) Closed cycle gas turbine
- c) Draw a neat layout of 'Thermal Power Plant'. List the components. Explain working of thermal power plant.

- 5. Attempt any FOUR of the following:** **16**
- a) Explain construction and working of Rock drill using compressed air.
  - b) What are the factors affecting volumetric efficiency of reciprocating air compressor?
  - c) Explain construction and working of Bomb calorimeter.
  - d) Explain concept of Tidal Power Plant.
  - e) List parameters for the site selection of Nuclear Power Plant.
  - f) Compare conventional sources of energy with non conventional energy sources.
- 6. Attempt any FOUR of the following:** **16**
- a) Estimate higher and lower calorific value of a coal having following composition by mass - Carbon 79%, Hydrogen-6.5%, Oxygen - 8%, Nitrogen - 2.5%, Sulphur - 1.5% and remaining is ash.
  - b) Determine the amount of heat required to produce 1 kg of steam at a pressure of 5 bar at a temperature of 24°C, under the following conditions:
    - (i) When the steam is wet having a dryness fraction 0.9.
    - (ii) When the steam is dry saturated.Assume specific heat = 2.35 kJ/kgK.
  - c) Explain Solar Power Plant and write its two advantages.
  - d) State merits and demerits of Wind Energy Power Plant.
  - e) Compare petrol and diesel on the basis of:
    - (i) Composition
    - (ii) Specific gravity
    - (iii) Gross calorific values
    - (iv) Volatility
  - f) Explain combustion chemistry of Carbon, Methane and Hydrogen.
-