



# 17554

11819

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**.*
  - (6) *Use of Non-programmable Electronic Pocket Calculator is **permissible**.*
  - (7) *Mobile Phone, Pager and any other Electronic Communication devices are **not** permissible in Examination Hall.*
  - (8) *Use of steam tables, logarithmic, Mollier's chart is **permitted**.*

**Marks**

1. A) Attempt **any six** :

**(6×2=12)**

- a) Give two examples each of renewable and non-renewable energy sources.
- b) State any one advantage and one disadvantage of hydroelectric power plant.
- c) List any four appliances working on solar energy.
- d) Define perpetual motion machine 1 and 2.
- e) State zeroth law of thermodynamics.
- f) State one example each of intensive and extensive property.
- g) Give one example each of fire tube and water tube boiler.
- h) State the function of nozzle in the working of steam turbine.
- i) Represent diesel cycle on P-V diagram.

**P.T.O.**



B) Attempt **any two** :

- a) Draw a neat sketch of geothermal power plant and explain its working.
- b) Differentiate between heat engine and heat pump (any four points).
- c) Differentiate between boiler mountings and accessories (any four points).

2. Attempt **any four** :

**(4×4=16)**

- a) Steam at 10 bar and 0.87 dry is available. Calculate the amount of heat required to be added per kg at constant pressure to make it dry saturated.
- b) Classify boilers with respect to following points :
  - i) Tube position
  - ii) Tube contents
  - iii) Furnace position
  - iv) Method of circulation.
- c) Draw the sketch of Mollier chart and show various lines on it. State the significance of Mollier chart.
- d) State Dalton's law of partial pressure. Apply it to steam condenser. Draw suitable sketch.
- e) State any two sources of air leakage in the steam condenser. State its effects (any two).
- f) In an otto cycle, maximum temperature is 2000°C and minimum temperature is 300°C. Mass flow rate is 1 kg/min. Compression ratio is 8. Calculate the power developed. Take  $\gamma = 1.41$  and  $C_v = 0.716 \text{ kJ/kg}^\circ\text{k}$ .

3. Attempt **any four** :

**(4×4=16)**

- a) Explain working of four stroke cycle petrol engine with suitable sketch.
- b) Draw the actual and theoretical valve timing diagram for a four stroke petrol engine.



[3]

**17554**  
**Marks**

- c) Compare two stroke and four stroke engines (any four points).
- d) Define supercharging. State purpose and methods of supercharging.
- e) Compare impulse and reaction turbine (minimum four points).
- f) Give detailed classification of steam turbines.

**4. Attempt any four :**

**(4×4=16)**

- a) List any four applications of heat exchangers.
- b) Draw a neat sketch of solar water heater. Label all parts.
- c) State steady flow energy equation with meaning of each term and apply it to steam condenser.
- d) Define the following terms :
  - i) Point function
  - ii) Path function.
  - iii) Open system
  - iv) Closed system.
- e) State two differences and two similarities between heat and work.
- f) Draw the neat sketch of natural draught cooling tower and explain its working.

**5. Attempt any two :**

**(8×2=16)**

- a) State Kelvin Plank and Clausius statements of second law of thermodynamics and show that they are equivalent.
- b) Draw a neat sketch of Cochran Boiler and explain its working.
- c) Draw the neat sketch of any one type of jet condenser and explain its working.



6. Attempt **any two** :

**(8×2=16)**

- a) Explain with neat sketch the procedure to determine the quality of steam using combined separating and throttling calorimeter.
  - b) i) Explain the term 'pre-ignition' in I.C. engines. State its causes and effects.  
ii) Explain the phenomenon of detonation in SI engines. Draw suitable sketches.
  - c) Explain with neat sketch, shell and tube heat exchanger.
-