15116

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. Attempt any FIVE of the following :   **(5 × 4) 20**

(a) State different sources of energy with their applications.

(b) State the second law of thermodynamics as per Kelvin-Plank statement and Clausius statement.

(c) Explain the concept of perpetual motion machines.

(d) How steam boilers are classified ?

(e) What are the sources of air leakage in condenser ? State their effect.

(f) State limitations of Carnot cycle.

(g) Write the applications and material used for shell and tube type heat exchangers.

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2. **Attempt any FOUR of the following :** **(4 × 4) 16**

    (a)   How does a fuel cell operate ?

    (b)   What do you understand by term entropy and enthalpy ?

    (c)   1 kg of steam at 4 bar pressure has a dryness fraction 0.75. How much heat shall have to be supplied at constant pressure to make it dry saturated ?

    (d)   Compare surface condenser and jet condenser.

    (e)   What is the effect of altitude on the performance of I.C. Engine ? How it is overcome ?

    (f)   What are the different types of heat exchangers ? Draw a labelled sketch of plate type heat exchanger.

3. **Attempt any FOUR of the following :** **(4 × 4) 16**

    (a)   What is geothermal energy source ? Write how it can be brought into use.

    (b)   Define thermodynamic property and give two examples.

    (c)   Explain with the help of neat sketch low water safety valve.

    (d)   What is a steam nozzle ? What are its applications in power engineering ?

    (e)   What is pre-ignition ? What are the reasons of pre-ignition ?

    (f)   Explain with neat sketch parallel flow heat exchanger and give its applications.

4. **Attempt any FOUR of the following :** **(4 × 4) 16**

    (a)   Explain zeroth law of thermodynamics.

    (b)   Define term 'dryness fraction'. State the dryness fraction for dry saturated steam.

    (c)   What are the functions of boiler mountings ? Can a boiler work without mountings ?

    (d)   Differentiate between impulse turbine and a reaction turbine.

    (e)   Define and explain : (i) Condenser efficiency (ii) Vacuum efficiency.

    (f)   Explain valve timing diagram for four stroke cycle spark ignition engine.

5. **Attempt any FOUR of the following :** **(4 × 4) 16**

(a) What is meant by Heat pump ? State relation between CoP of refrigerator and CoP of heat pump.

(b) Explain the concept of irreversibility.

(c) State the use of Mollier Chart.

(d) State and explain Dalton's law of partial pressure.

(e) State the functions of cooling tower and explain with sketch forced-draught cooling tower.

(f) What is super charging ? Where it is necessary ?

6. **Attempt any TWO of the following :** **(2 × 8) 16**

(a) Write down the general steady flow energy equation and also write the simplified equations when used for the following systems :

(i) Boiler

(ii) Turbine (water or steam)

(iii) Compressor

(iv) Nozzle

(b) Explain with neat sketch the construction and working of LaMont boiler.

(c) What is scavenging in I.C. Engine ? State the different methods of scavenging and explain any one in brief.

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