21819

3 Hours / 70 Marks Seat No. | | | | | | | | |

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 Non-programmable Electronic Pocket Calculator is permissible.

Marks

1. Attempt any FIVE of the following : **10**

(a) State the Clausius statement of second law of thermodynamics.

(b) Define :

(i) Dryness fraction of steam

(ii) Dry saturated steam

(c) Define I.C. Engine. Give it's applications.

(d) What is Mach number in relation to De Laval nozzle ?

(e) State the unit of Brake Power and define Brake Thermal Efficiency.

(f) State the meaning of HVAC.

(g) Define Ton of Refrigeration.

2. Attempt any THREE of the following : **12**

(a) Draw the schematic sketch of water tubes, headers, baffles and blow-off-cock as parts of Babcock and Wilcox boiler and label it.

(b) Sketch the labelled layout of steam power plant and describe the function of cooling tower.

(c) Describe the need of compounding in steam turbines. State the name of compounding method for reaction turbines.

(d) List any two methods to reduce sulfur dioxide (SO_2) emission from thermal power plants.

3. Attempt any THREE of the following : **12**

(a) A self start S.I. engine of a motorcycle fails to start. State any four reasons and remedies thereof.

(b) State any four applications of Gas turbine power plant.

(c) State two types of gas turbine power plants and compare them.

(d) The head over a Pelton wheel nozzle is 350 m of water of density 1000 kg/m^3. The spear valve is set to discharge 3.5 m^3/s. Find out the power of the turbine. Take g = 9.81 m/s^2.

4. Attempt any THREE of the following : **12**

(a) Describe the working of screw compressor with neat sketch.

(b) State any two methods to reduce power consumption of air compressors with justification.

(c) It is proposed to purchase compressor for furnace of smithy shop of workshop of polytechnic :

(i) State the most suitable type of compressor.

(ii) Justify your answer.

(d) A four stroke Diesel engine has Brake thermal efficiency of 25.6% while it delivers 6.5 kW of Brake power. Calculate the rate at which heat is supplied to engine.

(e) In order to determine efficiency of a centrifugal pump, the following observations were made :

Pressure gauge reading on suction side = 2.5 m of water

Pressure gauge reading on delivery side = 125 m of water

Total discharge of the pump = 0.25 m^3/s

Total input to the pump = 430 kW

Find efficiency of the pump.

5. Attempt any TWO of the following : **12**

(a) It is proposed to use window air-conditioner for air-conditioning of the room of 4m × 4m × 4m size. State the suggestions for energy saving with justification.

(b) State the functions of following components of refrigerator :

(i) Thermostat

(ii) Defrost heater

(iii) OLP

(iv) HP & LP cut out

(c) It is observed that when refrigerator is switched ON, the compressor starts but there is no cooling. Mention the possible causes with remedies.

6. Attempt any TWO of the following : **12**

(a) Draw a neat labelled schematic sketch of vapour compression cycle and state the function of :

(i) Compressor

(ii) Condenser

(iii) Expansion valve

(b) Explain the purpose of :

(i) Boiler mountings

(ii) Boiler accessories

(iii) Fusible plug

(c) Draw a neat sketch of Francis turbine in two views and show the following components on it :

(i) Draft tube

(ii) Guide vanes or wicket gates
