



C14-M-504

4652

BOARD DIPLOMA EXAMINATION, (C-14)
OCT/NOV—2017
DME—FIFTH SEMESTER EXAMINATION

HEAT POWER ENGINEERING—II

Time : 3 hours]

[Total Marks : 80

PART—A

3×10=30

Instructions : (1) Answer **all** questions.

(2) Each question carries **three** marks.

(3) Answers should be brief and straight to the point and shall not exceed *five* simple sentences.

1. Find out the condition of steam if its pressure is 10 bar and enthalpy is 2600 kJ/kg. 3
2. List out any six properties of steam. $\frac{1}{2} \times 6 = 3$
3. List out important special features of modern high pressure boilers. 1+1+1
4. What is boiler mountings with boiler accessories? 3
5. Define critical pressure ratio. Write an expression for it in terms of inlet pressure, throat pressure and index of expansion. 1+2=3
6. Draw the line diagrams of convergent, divergent and convergent-divergent nozzles. 1+1+1=3

- * 7. Write the advantages of steam turbines over steam engines. 3
8. What is governing of steam turbines? List any two methods of governing of a steam turbine. 1+2=3
9. State the functions of a steam condenser. 3
10. Draw a line diagram of shell and tube surface condenser and label the parts. 2+1=3

PART—B

10×5=50

- Instructions :** (1) Answer *any five* questions.
 (2) Each question carries **ten** marks.
 (3) Answers should be comprehensive and the criterion for valuation is the content but not the length of the answer.

11. If 1 kg of steam with a dryness fraction of 0.8 expands adiabatically, according to the law $pv^{1.3}$ constant from a pressure of 10 bar to 2.8 bar, determine the (a) final condition of steam, (b) work done, (c) heat transfer and (d) change in internal energy. 3+2+2+3=10

12. Describe the working of Benson boiler with a line diagram and label its parts. 4+4+2=10

13. During test on a boiler the following data were collected :

Steam pressure—10.5 bar abs

Steam condition—dry and saturated

Feed water temperature—35 °C

Rate of evaporation—12 kg/kg of coal

Calorific value—37500 kJ/kg

- Determine the (a) factor of covalent of evaporation, (b) equivalent evaporation and (c) thermal efficiency. 4+3+3=10

- * **14.** Determine the diameters of throat and exit for a steam nozzle to convey 10 kg/min, where the inlet conditions are 12 bar and 250 °C and the final pressure is 2 bar, neglect initial velocity of steam and effect of friction. 6+4=10
- 15.** (a) Describe supersaturated flow of steam in a nozzle with the aid of Moellier diagram.
 (b) List out the differences between jet and surface condensers. 5+5=10
- 16.** (a) Describe about pressure compounding of steam turbine.
 (b) Write any six differences between impulse and reaction steam turbines. 4+6=10
- 17.** Steam issues from a nozzle at 900 m/s. The velocity of moving blade is 350 m/s and the mass of steam flow is 2.5 kg/s. The nozzles are inclined at 15° to the plane of the wheel; neglecting friction, and inlet, outlet angles of blade are equal. Find the (a) power developed, (b) blade angle at inlet, (c) blade efficiency and (d) axial thrust. 5+1+2+2
- 18.** The following observations were made during a trial on a steam condenser :
- Barometric pressure—760 mm of Hg
 - Vacuum reading—710 mm of Hg
 - Rate of cooling water—18 kg/sec
 - Inlet temperature of cooling water—18 °C
 - Outlet temperature of cooling water—28 °C
 - Quantity of steam condensed—25 kg/minute
 - Hot-well temperature—30 °C
 - Mean temperature of condensate—33 °C
- Determine (a) vacuum efficiency, (b) condenser efficiency, (c) dryness fraction of exhaust steam, (d) sub-cooling of condensate and (e) amount of air leakage per kg of steam condensed.
- Assume R for air = 0.287 kJ/kg-K and specific heat of water = 4.182 kJ/kg-K. 2+2+3+1+2=10
