4652

C14-M-504

4652

BOARD DIPLOMA EXAMINATION, (C-14)

JUNE—2019

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. Define dryness fraction and degree of superheat of steam.

2. A container contains 5 kg of steam at a pressure of 800 kPa. Determine the specific enthalpy and specific volume of the steam when the steam holds 10% moisture.

3. How are steam boilers classified?

4. What are the advantages of water tube boilers?

5. Explain the flow of steam through steam nozzles.

6. Steam enters a steam nozzle with a velocity of 20 m/sec and with an enthalpy of 2900 kJ/kg. Determine the exit velocity of the steam if the enthalpy of the steam at the exit of the nozzle is 2200 kJ/kg.

7. Classify steam turbines.

8. Write three differences between Impulse turbines and reaction turbines.

9. What is the function of a steam condenser in a steam power plant.

10. Write the classification of steam condensers and explain in short any one condenser.

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. 1 Kg of dry saturated steam expands in a cylinder according to the law $PV^{1.2}$ = constant from 1.1 MPa to 0.1 MPa. Determine *a)* final quality of the steam *b)* final volume *c)* work done and *d)* heat transferred.

12. Draw the neat sketch of a Lamont boiler, label its parts and explain its working.

13. The following data is recorded during a test on a steam boiler.

Steam pressure : 1000 kPa

Steam quality : Dry and saturated

Feed water temperature : 35^0 C

Rate of evaporation : 12 kJ/kg of coal

Heating value of the fuel : 40,000 kJ/kg

Calculate *(a)* Thermal efficiency of boiler *(b)* Factor of evaporation and *(c)* equivalent evaporation of the boiler.

14. Super heated steam at 40 bar and 260^0 C enters a convergent nozzle at the rate of 10 kg/sec and leaves the nozzle at 14 bar. Determine the diameter of the nozzle at its exit. Neglect friction and initial. velocity of the steam. Assume C_p for super heated steam to be 2.1 kJ/kg-K.

15. What is compounding of steam tubines ? Explain the pressure velocity compounded impulse turbine with a neat sketch.

16. In an impulse turbine the nozzle delivers 25 kg of steam per second. The nozzle angle is 15^0. The steam issues from the nozzle with a velocity of 900 m/s. The blade velocity is 350 m/s. The inlet and outlet angles of the blades are equal. Neglecting friction, calculate *(a)* The blade angles *(b)* developed and *(c)* diagram efficiency.

17. In a steam condenser the mean condensate temperature is 35^0 C. The vacuum in the condenser is 675 mm of Hg while barometric reading is 760 mm of Hg. The cooling water enters the condenser at 20^0 C and leaves at 27^0 C. Calculate the condenser efficiency and vacuum efficiency.

18. *(a)* Wet steam 90% dry enters a convergent-divergent nozzle at a pressure of 12 bar and leaves it at 0.15 bar. The steam is 86.9% dry as it reaches its throat. If the flow of steam through the nozzle is frictionless adiabatic, determine the mass flow rate of the steam in kg/min.

(b) Determine the mass of injection water per kg of steam condensed, if the exhaust steam is at 0.15 bar abs and has a dryness fraction of 0.9. Temperature of injection water at inlet is 20^0 C. Allow 5^0 C of under cooling and specific heat of water is 4.2 kJ/kg k.

* * *