

7658

BOARD DIPLOMA EXAMINATION, (C-20)

DECEMBER—2022

DME - FIFTH SEMESTER EXAMINATION

HEAT POWER ENGINEERING—II

Time : 3 hours]

[Total Marks : 80

PART—A

- 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 of steam and write the mathematical expression. 3
2. Write expressions for enthalpy of (a) dry steam, (b) wet steam and (c) superheated steam at a given pressure. 1+1+1
3. 1 kg steam having a pressure of 10 bar and wet with 0.8 dryness fraction. Find enthalpy and internal energy. 3
4. Classify boilers based on any two criteria. 3
5. Differentiate between fire tube and water tube boilers. 3
6. Write any three applications of steam nozzles. 3
7. Steam enters a nozzle at 15 bar and 300 degree centigrade and expands to 2 bar and a quality of 85% dry. Determine velocity at exit (use steam tables). 3
8. What is governing of steam turbines? List out the methods of governing of steam turbines. 1½+1½
9. List out the elements of steam condensing plant. 3
10. Write any three advantages of surface condensers over jet condensers. 3

PART—B

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

- 11.** (a) Steam at a pressure of 4 bar and dryness 0.7 is allowed to expand at a constant volume, until the pressure rises to 5.5 bar. Find the final condition of steam and heat absorbed by 1 kg of steam. 4+4

(OR)

- (b) 2 kg of steam at a pressure of 8 bar and 0.8 dry is heated at constant pressure until the final temperature is 250 degree centigrade. Determine (i) the heat added and (ii) change in internal energy. Take $C_p = 2.1$ kJ/kgK. 4+4

- 12.** (a) Describe with a neat sketch the construction and working principle of Benson boiler. 8

(OR)

- (b) Describe with a neat sketch the construction and working principle of Green's economiser. 8

- 13.** (a) Wet steam at 10 bar and dryness fraction of 0.9 is discharged through a convergent-divergent nozzle to a back pressure of 0.1 bar. If the mass flow rate is 0.5 kg/s, then determine the throat pressure and throat diameter using Mollier diagram. 4+4

(OR)

- * (b) Dry saturated steam at a pressure of 8.2 bar abs. enters a convergent-divergent nozzle and leaves it at a pressure of 1.4 bar abs. If the flow is frictionless adiabatic and the corresponding expansion index is 1.135, if the mass flow rate is 0.65 kg/s determine the exit diameter. 8

- 14.** (a) Explain velocity compounding of steam turbines with the help of pressure and velocity variation graphs. 8

(OR)

- (b) With a neat sketch explain nozzle control governor and write any two advantages. 8

15. (a) With a neat sketch explain the low level parallel flow jet condenser. 8

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(OR)

(b) With a neat sketch, explain the evaporative surface condenser. 8

PART—C

10×1=10

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

16. In a De-level steam turbine, the steam enters the wheel through a nozzle with a velocity of 500 m/s and at an angle of 20 degree to the direction of motion of the blade. The blade speed is 200 m/s and the exit angle of the moving blade is 25 degree. Neglecting the friction find (a) blade efficiency and (b) what is the effect on blade efficiency if the nozzle angle increased from 20 degree to 22 degree. 10

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