1518 **Code : 15ME52T**

Register Number | | | | | | | | | | |

V Semester Diploma Examination, April/May-2019

APPLIED THERMAL ENGINEERING

Time : 3 Hours] **[Max. Marks : 100**

Note : (i) Answer any **six** full questions from PART – **A** & any **seven** full questions from Part – **B**.

(ii) Use of steam tables and Mollier chart is permitted.

(iii) Assume suitable missing data.

PART – A

1. (a) State functions of Steam calorimeter. **2**

   (b) List the types of steam calorimeter. **3**

2. Explain the process of formation of steam at constant pressure with a neat sketch. **5**

3. (a) Define steam boiler. **2**

   (b) List the types of steam boilers based on the following factors :

   (i) According to position of furnace.

   (ii) According to number of tubes.

   (iii) According to method of circulation of water and steam. **3**

4. Distinguish between Natural draught and Artificial draught system. **5**

5. List the functions of steam condenser and a steam nozzle. **5**

6. Define : **5**

   (i) Critical Pressure ratio

   (ii) Nozzle efficiency

[Turn over

7. Explain pressure compounding of steam turbine with a neat diagram. 5

8. Give classifications of Air compressors. 5

9. (a) Define Air Conditioning. 2

(b) List any Six Desirable properties of a good refrigerant. 3

PART – B

10. Determine the quantity of heat required to produce a 1 kg of steam at a pressure of 6 bar from water at 25 °C, under the following conditions :

(i) When steam is wet having a dryness fraction of 0.9.

(ii) When steam is dry saturated.

(iii) When it is superheated at a constant pressure to a temperature of 250 °C, assuming specific heat of superheated steam as 2.3 kJ/kg-K. 10

11. Sketch and explain the working of a Cochran Boiler. 10

12. Calculate the enthalpy and internal energy of 1 kg of dry saturated steam at a pressure of 10 bar. If this steam be expanded to a pressure of 1.6 bar and 0.8 dry. Determine the change in enthalpy and internal energy. 10

13. (a) Explain the function of following : 5

(i) Safety Valve

(ii) Fusible plug

(iii) Air preheater

(b) Explain the need for compounding of steam turbine. 5

14. A convergent – divergent nozzle is required to discharge 360 kg of steam per hour. The nozzle is supplied with steam at a 10 bar and 90% dry and discharge against a back pressure of 2 bar. Neglecting the effect of friction, calculate the throat and exit diameters. Use Mollier chart only. 10

15. (a) Explain with a neat sketch, parallel flow jet condenser. 5

(b) Explain with a neat sketch, Natural draught cooling tower. 5

16. Construct a combined velocity diagram for an impulse turbine and explain all the essential notations incorporated on the diagram. 1518

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17. The steam leaves the nozzle of a impulse turbine with a velocity of 1200 m/s. The nozzle angle is 20°. The blade velocity is 350 m/s and blade velocity coefficient is 0.75. Calculate for a mass flow rate of 0.5 kg/s and symmetrical blading.

(i) Tangential force on the wheel.

(ii) Axial thrust on the wheel.

(iii) Power developed

(iv) Diagram efficiency

Use graphical method only.

10

18. A single – acting, single stage reciprocating air compressor developing indicated power of 11 kW, runs at 200 rpm and has a linear piston speed of 100 m/min. If the suction pressure and temperature are 1 bar and 15 °C respectively, and delivery pressure is 10 bar, calculate the dimensions of the compressor cylinder. Assume the law of compression to be $PV^{1.25} = C$. Neglect the effect of clearance. 10

19. (a) Explain with a flow diagram, Vapour absorption refrigeration system. 6

(b) Sketch and label summer air conditioning system. 4