

**1774****Code : 15ME52T**Register  
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**V Semester Diploma Examination, Nov./Dec. 2017****APPLIED THERMAL ENGINEERING****Time : 3 Hours ]****[ Max. Marks : 100**

- Note :** (i) Answer any **six** questions from Part – A and any **seven** from Part – B.  
(ii) Use of steam tables and Mollier chart is permitted.  
(iii) Assume suitable missing data.

**PART – A****(Each question carries 5 marks)**

1. Define :  
(a) Wet steam (b) Superheated steam  
(c) Saturation temperature (d) Dryness fraction of steam  
(e) Dry saturated steam
2. Explain with a neat sketch a Barrel type steam Calorimeter.
3. List both the boiler mountings and accessories.
4. Differentiate between water tube and firetube boiler.
5. Sketch and explain Barometric jet condenser.
6. List the functions of cooling tower and classify the cooling towers.
7. Compare Impulse and Reaction turbines.
8. Explain in brief the working principle of single stage reciprocating air compressor with a neat figure.
9. Define :  
(a) Refrigeration (b) C.O.P.  
(c) Dry air (d) Absolute humidity  
(e) Dew point temperature

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**PART – B****(Each question carries 10 marks)**

10. The steam enters an engine at a pressure of 12 bar with a 65 °C of superheat. It is exhausted at a pressure of 0.15 bar and 0.95 dry. Find the drop in enthalpy of the steam. Use steam tables only. **10**
11. Sketch and label a Babcock & Wilcox boiler. **10**
12. With a neat sketch explain Carnot cycle and also derive its efficiency. **10**
13. (a) Compare natural draught and artificial draught system. **5**  
 (b) Explain velocity compounding of impulse turbine. **5**
14. Superheated steam enters a convergent – divergent nozzle at 20 bar and 400 °C with a negligible velocity and mass flow rate of 2.5 kg/s and it exits at a pressure of 3 bar. The flow is isentropic between the nozzle entrance and throat and overall efficiency is 90%. Determine (a) Throat and (b) Exit areas. **10**  
 Use Mollier chart only.
15. (a) Explain Friction in a Nozzle. **5**  
 (b) Explain super saturated flow through Nozzle. **5**
16. Steam issues from the nozzle of a simple impulse turbine with a velocity of 900 m/s. The nozzle angle is 20°, the mean diameter of the blade rotor is 25 cm and the speed of rotation is 20,000 rpm. The mass of flow of steam through the turbine nozzle and blading is 0.18 kg/s. Draw the velocity diagram and calculate : **10**  
 (i) Power developed  
 (ii) Blade efficiency  
 (iii) Tangential force on blades  
 (iv) Axial force on blades  
 (v) Inlet angle of blades  
 Use graphical method only.
17. Explain with a neat line diagram the construction and working of De-Laval turbine. **10**
18. A single cylinder single acting reciprocating air-compressor has a cylinder of 24 cm dia. and linear piston speed of 100 m/min. It takes air at  $100 \times 10^3 \text{ N/m}^2$  and delivers at  $1 \times 10^6 \text{ N/m}^2$ . Determine the indicated power of the compressor. Assume the law of compression to be  $PV^{1.25} = C$ . The inlet temperature of air at inlet is 288 K. Neglect the clearance effect **10**
19. (a) Explain with a neat sketch vapour compression refrigeration system. **5**  
 (b) Explain with a neat sketch winter air-conditioning system. **5**

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