Reg. No. _____

Karunya University

(Karunya Institute of Technology and Sciences)

(Declared as Deemed to be University under Sec.3 of the UGC Act, 1956)

End Semester Examination – MAY/JUNE - 2014

Subject Title: THERMAL ENGINEERING - I **Time: 3 hours**

Subject Code: 12ME214 **Maximum Marks: 100**

Answer ALL questions

PART – A (10 x 1 = 10 MARKS)

(Use of standard thermodynamic tables, Mollier diagram, Psychrometric chart and Refrigerant property tables are permitted).

1. What is the function fusible plug.
2. Define equivalent evaporation.
3. What is convergent-divergent nozzle?
4. What are the reasons for the reduced exit velocity for a given pressure drop.
5. Define blade velocity coefficient.
6. What is the function of fixed blades in a turbine?
7. The ratio of effective swept volume (actual volume) to the swept volume (theoretical volume) is known as _____ of a compressor.
8. Define Isothermal efficiency.
9. When air passes over a coil surface which is at a temperature greater than its (air) dry bulb temperature, then the process is known as _____.
10. What is sensible heat factor?

PART – B (5 x 3 = 15 MARKS)

11. Write the heat losses in a boiler plant.
12. Write the general energy equation of for a steady flow system and from this obtain energy equation for nozzle.
13. Write the differences between reaction turbine and impulse turbine?
14. A single stage single acting compressor has to compress air isentropically fron 1 bar and 303K to 5 bar. Find the work of compression required for unit mass flow rate of air.
15. Show the superheating and sub-cooling processes on p-h and T-s diagrams.

PART – C (5 x 15 = 75 MARKS)

16. Explain the working principle of babcock and Wilcox boiler

(OR)

17. Explain the heat balance sheet.
18. A convergent-divergent nozzle is to be designed in which steam initially at 14 bar and 275^0C is to be expanded down to a back pressure of 1.05 bar. Determine necessary throat and exit diameters of the nozzle for a steam discharge of 500 kg/hr, assuming that the expansion is in thermal equilibrium throughout and friction reheat amounting to 12% of the total isentropic enthalpy drop to be effective in the divergent part of the nozzle.

[P.T.O]

(OR)

19. Dry saturated steam at a pressure of 15 bar enters in a nozzle and is discharged at a pressure of 1.5 bar. Find the final velocity of the steam, when the initial velocity of steam is negligible. If 10% of heat drop is lost in friction, find the percentage reduction in the final velocity.
20. Explain the velocity-pressure compounding of a impulse turbine.

(OR)

21. Draw the velocity triangles and derive the efficiencies.

22. Following data relate to a performance test of a single stage, single-acting air compressor: D = 14 cm; L = 10 cm; suction pressure = 1 bar; suction temperature = 20^0C; discharge pressure = 6 bar; discharge temperature = 180^0C; speed of compressor = 1200 rpm; shaft power = 6.25 kW; mass of air delivered = 1.7 kg/min. Determine the following: a. The actual volumetric efficiency b. The indicated power c. The isothermal efficiency d. The mechanical efficiency. Take Cp = 1.005 kJ/kg K and R = 0.287 kJ/kg K.

(OR)

23. A two-stage single acting air compressor takes in air at the rate of 0.2 m^3/sec. The intake pressure and temperature of air are 0.1 MPa and 16^0C. The air is compressed to a final pressure of 0.7 MPa. The intermediate pressure is ideal and intercooling is perfect. The compression index in both the stages is 1.25 and the compressor runs at 600 rpm. Neglecting clearance, determine: a. the intermediate pressure b. the total volume of each cylinder c. the power required to drive the compressor. Take Cp = 1.005 kJ/kg K and R = 0.287 kJ/kg K.

24. Explain briefly the principle of vapour compression refrigeration system.

(OR)

25. Explain in detail the working principle of a vapour absorption refrigeration system with suitable sketch.