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GEC-R14

III B. Tech I Semester Regular / Suppl. Examinations, November 2017

THERMAL ENGINEERING-II

(Mechanical Engineering)

Max. Marks: 60

Note: All Questions from **PART-A** are to be answered at one place.

Answer any **FOUR** questions from **PART-B**. All Questions carry equal Marks.

PART-A

$$6 \times 2 = 12\text{M}$$

- Carnot vapor power cycle efficiency operating between maximum temperature limits of 250°C and 75°C is ____.
A) 70% B) 33 %
C) 42 % D) 50 %
- Suggest the devices for the safe function of a boiler.
- Sketch the expansion process in a nozzle on h-s and T-s planes.
- Draw the combined velocity diagram for an impulse turbine and mark all the angles.
- State the main objective of a condenser in steam power plant.
- a) What are the processes in Bell -Coleman Refrigeration cycle.
b) List out the various process in Vapor compression refrigeration Cycle.

PART-B

$$4 \times 12 = 48\text{M}$$

1. a) Compare Rankine cycle with Carnot vapor power cycle. (4M)
b) Determine the thermal efficiency and work output of a steam power plant operating between 40 bar and 0.1 bar, when the inlet condition of steam to turbine is superheated by 50°C . Take isentropic efficiency of turbine and pump as 90% each. (8M)
2. a) Compare fire tube and water tube boilers. (4M)
b) The steam used by a turbine is 5.4 kg/kW-hr at a pressure of 50 bar and at a temperature of 350°C . The efficiency of boiler is 82% with feed water at 150°C . If calorific value of coal is 28100 kJ/kg , find the quantity of coal to be burnt to produce kW-hr energy. (8M)
3. Estimate the rate of flow of steam for a steam turbine which uses convergent nozzles. The expansion of steam is isentropic. The total area of the nozzle at the exit is 30 cm^2 . At inlet to these nozzles, the steam is at 6 bar and 260°C . The exit pressure is 4 bar. Neglecting the inlet velocity, find the condition of steam at the exit. If the coefficient of discharge of the nozzle is 0.95, what should be the actual exit area assuming that the velocity and specific volume are the same. (12M)

4. Steam with absolute velocity 300 m/s enters the stage of an impulse turbine provided with a single row wheel. The nozzles are inclined at 20° to the plane of wheel and the rotor blades are equiangular. The rotor with mean diameter 100 cm rotates with speed of 3000 rpm. Estimate the power developed in the blade if the axial thrust in the blades is 145 N. It may be assumed that due to friction in the blade passages the kinetic energy due to outgoing relative velocity is only 67% of the kinetic energy due to incoming relative velocity. (12M)
5. a) With help of neat sketch explain
- i) Down flow surface condenser ii) Evaporative condenser (6M)
- b) 950kg of steam with 0.9 dry is handled by a condenser. The mean condenser temperature is 45°C . The amount of air associated with the steam in the condenser is 260kg/h. Find the vacuum reading? The Barometer reads 75mm of Hg, correct this vacuum to a standard barometric reading. (6M)
6. With help of neat sketch describe the vapor absorption cycle for ammonia-water system and its working. State its merits and demerits over vapor compression cycle. (12M)
