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Roll No

ME-5001 (CBGS)**B.E. V Semester**

Examination, December 2017

Choice Based Grading System (CBGS)**Turbo Machinery***Time : Three Hours**Maximum Marks : 70*

- Note:** i) Attempt any five questions. All questions carry equal marks.
 ii) Use of steam table and mollier chart permitted in side exam hall.

1. The steam consumption in a Parson's reaction turbine running at 400rpm is 5kg/s. The pressure of the steam at a certain pair is 2 bar, its dryness is 0.96 and the power developed by the pair is 4.4kW. The discharging blade tip angle is 20° for both fixed and moving blades and the axial velocity of flow is 0.72 of the blade velocity. Calculate the drum diameter and the blade height, assuming the tip leakage as 5 percent and neglecting the blade thickness.
2. In a vertical-shaft Francis turbine the available head at the inlet flange of the turbine is 150m and the vertical distance between the runner and the failrace is 1.95m. The runner tip speed is 34.5m/s, the velocity of the water entering the runner is 39m/s and the velocity of the water exiting the runner is constant and equal to 10.5m/s. The flow velocity at the exit of the draft tube is 3.45m/s. The hydraulic energy losses estimated from the turbine are equal to 6m at the volute 1.05m at the draft tube, and 9.9m at the runner. Determine the pressure head (with respect to the failrace) at the inlet and exit of the runner, the flow angle at the runner, inlet and the efficiency of the turbine.

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3. Centrifugal air compressor delivers 18.2 kg/s of air with a total pressure ratio of 4 to 1. The speed of the compressor is 15000 rpm. Inlet total temperature is 15°C , slip factor 0.9, power input factor 1.04 and 80% isentropic efficiency, calculate the overall diameter of the impeller and power input.
4. Deduce Euler's equation used for turbo machineries and enlist assumptions used for deriving it.
5. a) Write down the velocity and pressure compounding details of steam turbines explain them with the help of pressure and velocity profiles.
 b) How degree of reaction is defined? Explain the concept of Parson's 50% reaction turbines?
6. a) Draw the vector diagram of centrifugal compressors and give the working of centrifugal pumps.
 b) Discuss the concept and definition of unit and specific quantities. How they are used for evaluating the performance of hydraulic machines.
7. a) Define following on connected to steam turbines stage efficiency, Vane efficiency, blade height, carry over efficiency, stator efficiency.
 b) Explain the phenomenon of cavitation as connected to water turbines? What's Thermal Parameter?
8. Write short notes on followings: (any four)
 - a) Fluid coupling
 - b) Torque converter
 - c) Hydraulic Intensifier
 - d) Hydraulic press
 - e) Positive displacement pump