Code :R7311302

$\boxed{\textbf{R7}}$

III B.Tech I Semester(R07) Supplementary Examinations, May 2011
PRIME MOVERS AND MECHANICAL COMPONENTS
(Electronics & Control Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE questions
All questions carry equal marks
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1. (a) Differentiate between
      i. The impulse and reaction turbines
      ii. Radial and axial flow turbines.

   (b) A pelton wheel has a bucket speed of 35m/s with a jet of water flowing at the rate of $1m^3/s$ under a head of 27 m. The bucket deflects the jet through an angle of 170^0. Calculate the power delivered to the runner and the hydraulic efficiency of the turbine. Assume co-efficient of velocity at 0.98.

2. (a) What is an air vessel? Describe the function of the air vessel for reciprocating pumps.

   (b) A single acting reciprocating pump running at 30 rpm delivers $0.012m^3/s$ of water. The diameter of the piston is 25cm and stroke length 50 cm. Determine
      i. The theoretical discharge of the pump
      ii. Co-efficient of discharge and,
      iii. Slip and percentage slip of the pump.

3. (a) What is a steam boiler? How they are classified?

   (b) Explain the construction and working of a Lancashire boiler with the help of suitable sketches.

4. (a) What do you understand by the evaporative capacity of a boiler?

   (b) A boiler produces 4kg of steam per kg of coal from feed water at 45^0C. The steam pressure is 10.5 bar. If the dryness fraction of steam is 0.98, determine the equivalent evaporation from and at 100^0 C.

5. (a) Explain the principles of impulse turbine.

   (b) A De-Lavel turbine it supplied with dry steam and works on a pressure range from 10.5 bar to 0.3 bar. The nozzle angle is 20^0 and the blade exit angle is 30^0. The mean blade speed is 270m/s. If there is a 10% loss due to friction in the nozzle and blade velocity coefficient 0.82, find the thrust on the shaft per KW power developed.

6. (a) What are the essential components of a simple open cycle gas turbine plant?

   (b) In a gas turbine plant, operating on Brayton cycle, air enters the compressor at 1 bar and 27^0C. The pressure ratio in the cycle is 6. Calculate the maximum temperature in the cycle and the power developed by the turbine. Assume the turbine work as 2.5 times the compressor work.

7. Explain with schematic diagram, various pumping units used in hydraulic systems.

8. (a) Explain kinematic link, kinematic pair and kinematic chain with examples.

   (b) What is degree of freedom of a mechanism? How it is determined?

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