Code No: RR210202 **RR**

II B.Tech I Semester(RR) Supplementary Examinations, May/June 2010
HYDRAULICS AND HYDRAULIC MACHINERY
(Electrical & Electronic Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Define mass density, weight density, specific volume and specific gravity.
   (b) A 30 cm diameter shaft revolves in a guide bearing of 60 cm long at 500 rpm. If the oil film bearing is 0.13 mm and viscosity of oil is $0.05 Ns/m^2$, find the power absorbed. [8+8]

2. (a) Briefly explain the classification of flows.
   (b) What type of acceleration is to be expected if
      i. Streamlines are parallel and equidistant
      ii. Streamlines are straight and converging
      iii. Streamlines are curved but equispaced
      iv. Streamlines are curved and converging. [8+8]

3. (a) Explain the different forms of energy in a fluid.
   (b) The cross-sectional area of a convergent pipe is so shaped that the velocity of flow along the centre line varies linearly from 1 m/s to 10 m/s in a distance of one metre. The pipe is inclined downward at an angle of 30^0 with horizontal. Determine the difference in pressure between the two points, assuming the specific weight of the liquid as $7.85 kN/m^3$. [8+8]

4. (a) List the Minor losses of energy in a pipe flow.
   (b) A piping system consists of three pipes arranged in series; the lengths of the pipes are 1200 m, 750 m and 600 m and diameters 750 mm, 600 mm and 450 mm respectively.
      i. Transform the system to an equivalent 450mm diameter pipe and
      ii. Determine an equivalent diameter for the pipe, 2550m long. [6+10]

5. (a) What is a pitot tube? How will you determine the velocity at any point with the help of pitot tube?
   (b) A pitot -tube is inserted in a pipe of 300 mm diameter. The static pressure in pipe is 100 mm of mercury (vacuum). The stagnation pressure at the center of the pipe, recorded by the pi tot-tube is $0.981 N/cm^2$, calculate the rate of flow of water through pipe, if the mean velocity of flow is 0.85 times the central velocity. Take the coefficient of pi tot-tube as 0.98. [8+8]

6. A jet of water at 12m/s impinges on a concave shaped vane to deflect the jet through 120^0 when stationary.If the vane is moving at 5m/s, find the angle of the jet so that there is no shock at the inlet. Also compute the absolute velocity of the jet at exit both in magnitude and direction,and the workdone per second per kg of water.Assume that the vane is smooth. [16]

7. In an inward flow reaction turbine the supply head is 12m and the maximum discharge is 0.28 m^3 / sec. External diameter = 2^* internal diameter, and the velocity of flow is constant and equal to 0.15 $\sqrt{2gH}$. The runner vanes are radial at inlet and the runner rotates at 300 RPM. Determine:
   (a) The guide vane angles.
   (b) The vane angles at exit for radial discharge,
   (c) The width of the runner at inlet and exit. The vanes occupy 10 % of the circumference and the hydraulic efficiency is 80%. [16]

8. (a) Derive the equation for the power required to drive the double acting reciprocating pump.
   (b) A single acting reciprocating pump runs at 60 RPM. The diameter of the plunger is 0.15m and crank radius is 0.15m. The suction pipe is 0.1m in diameter and 5m long. Calculate the maximum permissible value of suction lift, if the separation takes place at 2.6m of water absolute. [8+8]

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