

Code No: R05210202

R05

Set No. 2

II B.Tech I Semester Examinations, May/June 2012
FLUID MECHANICS AND HYDRAULIC MACHINERY
Electrical And Electronics Engineering

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) What are the aspects of hydraulic design of Pelton wheel? Derive the equation for work done on the runner of a Pelton wheel from fundamentals.
(b) Determine the efficiency of a reaction turbine producing 2500 kW under a net head of 6 m. It is provided with a draft tube of inlet diameter of 3m and the inlet is 1.6 m above the tail race level. A vacuum gauge connected to the draft tube indicates a reading of 5.3 m of water. Assume draft tube efficiency as 58% and neglect the loss in the draft tube. [8+8]
2. (a) Differentiate between
 - i. Liquids and gases
 - ii. Real fluid and ideal fluid(b) A U-tube differential manometer has been arranged to measure the pressure difference between two points A and B in a sloping pipeline conveying water. The point B lies 20 cm higher than point A. If the difference in the level of mercury in limbs of U-tube is 60 cm, calculate the pressure difference ($p_A - p_B$). [8+8]
3. (a) What are the different efficiencies associated with working of a centrifugal pump? Explain the use of NPSH in the working of centrifugal pump.
(b) The diameter of the piston and stroke length of a reciprocating pump are 200 mm and 300 mm respectively. The pump delivers water at a rate of 7.36 litres / sec / sec and the speed is 50 rpm. The suction and delivery heads are 3.5m and 11.5 m respectively. Determine
 - i. Coefficient of discharge
 - ii. Percentage slip of the pump and
 - iii. Power required to run the pump[8+8]
4. (a) Derive an expression for the force exerted by a jet on stationary curved plate, if the jet strikes the curved plate at the center.
(b) A jet of water 120 mm in diameter and moving with a velocity of 25 m/sec strikes normally on a flat plate. Determine the force exerted on the plate and the work done when
 - i. the plate is stationary
 - ii. the plate is moving with a velocity of 8 m/sec in the direction of the jet
 - iii. the plate is moving with a velocity of 8 m/sec towards the jet. [7+9]

5. (a) Write about significance of geometric similarity in model testing of turbines. How do you maintain geometric similarity in laboratory model testing with scale ratios.
- (b) A turbine develops 10,000 kW under a head of 25 m at 150 rpm. What is the specific speed? What would be its speed and output under a head of 35 m. [8+8]
6. (a) Explain the principle and working of pitot tube with the help of a neat sketch.
- (b) Petroleum oil of (specific gravity = 0.93 and viscosity = 13CP) flows isothermally through a horizontal 5 cm pipe. A pitot tube is inserted at the center of a pipe and its leads are filled with the same oil and attached to a V-tube containing water. The reading on the manometer is 10 cm. Calculate the volumetric flow of oil in m^3/sec . The coefficient of pitot tube is 0.98. [8+8]
7. (a) The water flows in a pipe line, whose diameter which changes from 20 cm at one end 'A' to 50 cm at another end 'B'. Pressures at two ends are $78.5 kN/m^2$ and $58.9 kN/m^2$ respectively. The flow rate is 200 litres per second. End B is higher than end A by 3 m. Determine the direction of flow.
- (b) What are the applications of Bernoulli's equation? [8+8]
8. (a) What is hydroelectric power station? What are its elements? Discuss them one by one elaborately with neat sketches.
- (b) A turbine works with overall efficiency of 83%. The gross head and flow rate are 88 m and $20 m^3/sec$. The frictional losses in penstock are 4 m. Calculate the power developed. [10+6]

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