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Code No: 123BX **R15**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, November/December - 2016
FLUID MECHANICS AND HYDRAULIC MACHINERY
(Electrical and Electronics Engineering)

Time: 3 Hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit.
Each question carries 10 marks and may have a, b, c as sub questions.

PART - A **(25 Marks)**

1.a) Explain intensity of pressure and pressure head. [2]
b) How the pressure can be measured by a manometer? [3]
c) What is Reynold's number and mention its significance? [2]
d) Explain the working principle of an orifice meter. [3]
e) What is the need of surge tank on penstock? [2]
f) What is catchment area and mention its importance? [3]
g) Differentiate between impulse and reaction turbine. [2]
h) How governing of speed is done on Pelton wheel? [3]
i) Differentiate between centrifugal pump and reciprocating pump. [2]
j) What is water hammer and how can it be eliminated? [3]

PART - B **(50 Marks)**

2.a) Describe the working of U-tube manometer with enlarged ends.
b) In a Brahma press, the plunger and cylinder are having areas of 50 and 5000 sq.cms. respectively. A weight of 4500 kg is kept on cylinder. The vessel and passages connecting plunger and cylinder is filled with oil of sp.gr 0.85. What force on the plunger is required for equilibrium? [3+7]

OR

3.a) Distinguish between i) steady and unsteady flow ii) uniform and non-uniform flow.
b) In a steady flow, two points A and B are 0.5 m apart on a straight stream line. If the velocity of flow varies linearly between A and B, What is the acceleration at each point, if the velocity at 'A' is 3 m/sec and velocity at 'B' is 8 m/sec. [3+7]

4.a) Explain the principle and working of venturi meter with a neat sketch.
b) Derive Darcy weisbach equation. [5+5]

OR

5.a) Derive Bernoulli's equation for incompressible fluids and mention its limitations.
b) A compound piping system consists of 2000 m of 0.6 diameter, 1000 m of 0.5 m diameter, 800 m of 0.4 m diameter, with new cast-iron pipes connected in series. Convert this system to i) an equivalent length of pipe of 0.4 m. diameter ii) an equivalent size of 4000 m. long. [3+7]

6.a) How the power can be estimated from the hydro-electric power station?

b) A Jet of water of 80 mm diameter with a velocity of 25 m/sec strikes a series of flat plates arranged around the periphery of a wheel such that each plate appears successively before the Jet. If the plates are moving at a velocity of 6 m/sec, find the force exerted by the Jet on the plate, work done per second and efficiency. [3+7]

OR

7.a) Explain about hydraulic efficiency, mechanical efficiency, volumetric efficiency of hydraulic turbine.

b) An inward flow reaction turbine with radial discharge has an overall efficiency of 85% is required to develop 160kW. The head is 10 m, peripheral velocity of the wheel is $0.95\sqrt{2gH}$, the radial velocity of flow is $0.4\sqrt{2gH}$, the wheel is made to run at160 rpm and the hydraulic losses to be 22% of the available energy. Find i) angle of guide blade at inlet. ii) vane angle at inlet. iii) diameter of wheel. [3+7]

8.a) What factors are to be considered during the selection of hydraulic turbine?

b) A Kaplan turbine produces 80 MW under a head of 30 m with an efficiency of 85%. Taking the value of speed ratio K_u as 1.6, flow ratio as 0.55 and hub diameter as 0.4 times the outer diameter, find the diameter and speed of turbine. [3+7]

OR

9.a) What are the various elements needed for hydro-electric power plant?

b) A Jet of water having a velocity of 50 m/sec impinges without shock on a series of moving vanes at 20 m/sec at an angle 20^0 to the direction of motion. The relative velocity at outlet is 0.9 of that at inlet and water at exit is normal to the motion. Find i) vane angles at inlet and exit ii) work done per unit weight iii) hydraulic efficiency. [3+7]

10.a) What are the hydraulic losses in centrifugal pump?

b) Find the power required to drive a centrifugal pump, which delivers 50 litres of water per sec to a height of 25 m through 125 mm diameter and 100 m long pipe line. The overall efficiency of pump is 80% and frictional coefficient f = 0.07 for the pipe line. Assume the inlet losses in suction pipe equal to 0.4 m. [3+7]

OR

11.a) Differentiate between volute diffuser type of pumps used in practice.

b) Derive an expression for specific speed of a centrifugal pump. [3+7]

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