Code: 13A01307 **R13**

B.Tech II Year I Semester (R13) Supplementary Examinations June 2017

FLUID MECHANICS & HYDRAULIC MACHINERY

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) An oil of 5 m^3 volume, weighs 48 kN. Compute the specific weight, mass density.

(b) State any two uses of flow nets.

(c) Define forced vortex flow. Give any one example.

(d) What do you meant by hydraulic gradient line and total energy line?

(e) Give the classification of turbines based on the action of the water on moving blades.

(f) State the formulae for hydraulic efficiency and mechanical efficiency.

(g) What are the functions of a draft tube?

(h) List out the causes of cavitation in centrifugal pumps.

(i) Write the classification of hydroelectric schemes.

(j) What is the main purpose of providing surge tanks?

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 (a) Explain the procedure of finding the pressure using single – column (vertical limb) manometer.

(b) Two large plane surfaces are 150 mm apart. The space between the surfaces is filled with oil of viscosity 0.972 N.s/m^3. A flat thin plate of 0.5 m^2 area moves through the oil at velocity of 0.3 m/sec. Calculate the drag force when the plate is in the middle of the two plane surfaces.

OR

3 (a) What do you understand by steady and unsteady flows? Give examples.

(b) The stream function for a two-dimensional flow is given by $\Psi = 2xy$, calculate the velocity at the point Q(1, 2). Find the velocity potential function.

UNIT – II

4 (a) Derive Euler's equation of motion along a stream line for an ideal fluid and derive Bernoulli's equation from Euler's equation.

(b) In an inclined venturimeter fitted to a 30 cm diameter pipe, 215 liters of oil (specific gravity = 0.82) flow per second downwards. The inclination of venturimeter is 30^0 to the horizontal and the throat diameter is 15 cm. The throat is located 1.2 cm from the entrance along its length. Pressure gauges fitted at entrance and throat show pressures of 0.141 N/mm^2 and 0.077 N/mm^2 respectively. Find the coefficient of discharge of the venturimeter.

OR

5 (a) Explain the term equivalent pipe and derive Dupit's equation.

(b) Two pipes of the same material and of equal length are available for connection to an overhead tank which can supply 0.085 m^3/s of water. The diameters of the pipes are 30 cm and 15 cm respectively. Determine the ratio of the head loss when the pipes are connected in series to the head loss when they are connected in parallel. Neglect minor losses.

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UNIT – III

6 (a) Derive an expression for the force exerted by the jet on a stationary curved plate at the centre.

(b) A jet of water of diameter 10 cm moving with a velocity of 20 m/s, strikes a curved fixed plate tangentially at one end at an angle of 30^0 to the horizontal. The jet leaves at an angle of 20^0 to the horizontal. Find the force exerted by the jet on the plate in the horizontal and vertical directions.

OR

7 Derive an expression for the maximum hydraulic efficiency of a pelton wheel.

UNIT – IV

8 (a) Briefly explain the construction and working of a Francis turbine.

(b) In a hydroelectric power station, water is available at the rate of 175 m^3/s under a head of 18 m. The turbine runs at a speed of 150 rpm, with overall efficiency of 82%. Find the number of turbines required, if they have the maximum specific speed of 460.

OR

9 (a) Describe multi stage centrifugal pumps with impellers in series.

(b) A centrifugal pump runs at 1000 rpm with their vane angles at inlet and outlet as 20^0 and 35^0 respectively. The internal and external diameters are 25 cm and 50 cm respectively. Find the work done per kg of water assuming velocity of flow as constant. Water enters radially through the pipe.

UNIT – V

10 With the help of a sketch, explain the principal components of hydroelectric scheme.

OR

11 (a) Briefly explain the classification of hydel plants according to their functions.

(b) Three turbo-generators each of capacity 10000 kW have been installed at a hydel power station. During a certain period of load, the load on the plant varies from 12000 kW. Calculate total installed capacity, load factor, plant factor and utilization factor.

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