Code No: R21021   **R10**   SET - 1

II B. Tech I Semester Supplementary Examinations, Dec - 2015
FLUID MECHANICS AND HYDRALICS MACHINES
(Com. to EEE, ME, MM)

Time: 3 hours   Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) What are the absolute and kinematic viscosities? Derive the equations for them. Discuss what factors will influence them   (7M)

   b) Estimate the pressure inside a water droplet of size of 0.3mm. Assume σ=0.073N/m.   (8M)

2. a) What is the criteria to distinguish rotational flow from irrotational flow?   (7M)

   b) Determine whether the flowing velocity components satisfy the continuity equation. i) u = A sin xy, v = −A sin xy ii) u = x + y, v = x − y.   (8M)

3. a) Differentiate between stagnation pressure head and static pressure head with reference to a pitot tube. Explain with the help of a neat sketch.   (7M)

   b) A venturimeter of throat diameter 5cm is fitted into a 12.5 cm diameter water pipe line. The coefficient of discharge is 0.96. Calculate the flow in the pipe line when the reading on a mercury water differential U tube manometer connected to the upstream and throat sections shows a reading of 20 cm   (8M)

4. a) A 15 cm diameter jet of water strikes a curved vane with a velocity of 40m/sec. The inlet angle of the vane is zero and the outlet angle is 30 degrees. Calculate the resultant force on the vane when it is moving with a velocity of 12m/sec in the direction of the jet   (7M)

   b) State the equation used to find out the impact of jet on vanes. Derive the equation for resultant thrust when a jet strikes a stationary inclined flat plate   (8M)

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5. a) What is a runoff river plant. What are the different parts and arrangements of such plants? Draw a neat sketch and explain (7M)

   b) What is meant by flow duration curve and power duration curve. How do you differentiate these two curves? Also explain power duration curve in detail (8M)

6. a) Differentiate between: i) The impulse and reaction turbines, ii) Radial and axial flow turbines, iii) Inward and outward radial flow turbine, and iv) Kaplan and propeller turbines (8M)

   b) A Pelton wheel is having a mean bucket diameter of 0.8 m and is running at 1000 r.p.m. The net head on the Pelton wheel is 400 m. If the side clearance angle is 150^0 and discharge through nozzle is 150 litres/s, find: i) Power available at the nozzle, and ii) Hydraulic efficiency of the turbine. (7M)

7. a) By means of a neat sketch explain the governing mechanism of Francis Turbine (6M)

   b) A Hydraulic turbine is to develop 845.6 kW when running at 100 r.p.m. under a head of 10 m. Work out the maximum flow rate and specific speed for the turbine if the overall efficiency at the best operating point is 92 percent. In order to predict its performance, a 1:10 scale model is tested under a head of 6 m. What would be the speed, power output and water consumption of the model if it runs under the conditions similar to the prototype? (9M)

8. a) What is the effect of acceleration in suction and delivery pipes on indicator diagram? Does the area of the indicator diagram change as compared to the area of ideal indicator diagram? (6M)

   b) A centrifugal pump impeller whose external diameter and width at the outlet are 0.8 m and 0.1 m respectively is running at 550 r.p.m. The angle of impeller vanes at outlet is 40^0. The pump delivers 0.98 m^3 of water per second under an effective head of 35 m. If the pump is driven by a 500 kW motor, determine: i) The manometric efficiency ii) The overall efficiency, and iii. The mechanical efficiency. Assume water enters the vanes radially at inlet (9M)