

Code No: R21021

R10

SET - 1

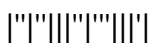
II B. Tech I Semester Supplementary Examinations, Oct/Nov - 2016
FLUID MECHANICS AND HYDRALICS MACHINES
(Com. to EEE, ME, MM)

Time: 3 hours

Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks

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1. a) Discuss the different types of manometers used in pressure measurement. (5M)
b) A velocity profile of a flowing fluid over a flat plate is parabolic and given by $u=ay^2 +by +c$ Where a, b and c are constants. The velocity of fluid is 1.2 m/s at 20 cm from the plate, which the vertex point of the velocity distribution. Find out the velocity gradients and shear stresses at $y = 0.10$ and 20 cm respectively. Take $\mu=8$ poise for the flowing fluid. (10M)
 2. a) The flow field is given by $\psi = x^3 y$ Check whether the given field exists or not? (7M)
Further check whether it is irrotational?
b) Given that $u = x^2 - y^2$ and $v = -2xy$, determine the stream function and potential function for the flow. (8M)
 3. a) Derive an expression for the loss of head due to: (6M)
i) Sudden enlargement and ii) Sudden contraction of a pipe.
b) A venture-meter is provided to measure the water flowing through a horizontal pipe of 25 cm diameter. The throat of the venture- meter is 12cm. The pressure of water flowing through the pipe is 1.5 bar and the vacuum measured at the throat is 30 cm of Hg. Find the water flow rate through the pipe. Take $C_d=0.975$. (9M)
 4. A jet of water having a velocity of 40 m/sec strikes a curved vane, which is moving with a velocity of 20 m/sec. The jet makes an angle of 30° with the direction of motion of the vane at inlet and leaves at an angle of 90° to the direction of motion of the vane at outlet. Draw the velocity triangles at inlet and outlet and determine the vane angles at inlet and outlet so that the water enters and leaves the vane without shock (15M)



5. a) What are the different heads and efficiencies associated with hydroelectric power plants? (7M)
- b) Write short notes on the following: (8M)
- Firm Power
 - Secondary power
 - Diversity factor
 - Load duration curve.
6. a) Explain the construction and operation of a Francis turbine with the help of a schematic diagram. (7M)
- b) A double jet pelton wheel operates under a 40 m head and develops 750 kW at 450 rpm. Calculate the flow rate and the diameter of the nozzle jet. Assume overall efficiency as 85% and coefficient of velocity as 0.98. (8M)
7. a) What do you understand by the characteristics curves of turbine? Name the important characteristics of a turbine. (7M)
- b) A reaction turbine develops 7000 KW under a head of 45m with a speed of 150 rpm. What is the specific speed of the turbine? What will be the power and speed when the turbine works under a head of 20m. (8M)
8. a) Define specific speed of a centrifugal pump? Derive the formula. (6M)
- b) A centrifugal pump having outer diameter equal to two times the inner diameter and running at 1000 rpm. Works against a total head of 40 m. The velocity of flow through the impeller is constant and equal to 2.5 m/s. The vanes are setback at an angle of 40° at outlet. If the outer diameter of the impeller is 500 mm and width at outlet is 50 mm. Find (9M)
- Vane angle at inlet
 - Work done by impeller on water/second and
 - Manometric efficiency.
