

Code No: R21021

R10

SET - 1

II B. Tech I Semester Supplementary Examinations, Oct/Nov- 2017

FLUID MECHANICS AND HYDRAULICS 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) State and explain Newton's viscosity law. (5M)  
b) A plate, 0.5 mm distance from the fixed plate moves with 50 cm/sec and requires 5 N/m<sup>2</sup> force to maintain the speed of moving plate. Determine the viscosity of the oil between the plates. (10M)
2. a) Differentiate between tangential and normal acceleration and find out the expressions for both. (7M)  
b) A converging pipe is 20 cm inlet and 10 cm outlet and 5 m long is lying in the vertical plane making an angle 45° to the horizontal. The pipe is carrying the water 24 m<sup>3</sup>/min. The pressure of the water at the inlet is 500 kPa, find the pressure of the water at the exit. (8M)
3. a) Describe Reynolds experiments to demonstrate the two types of flow. (6M)  
b) An oil of sp.gr. 0.9 and viscosity 0.06 poise is flowing through a pipe of diameter 200mm at the rate of 60 liters/s. Find the head lost due to friction for a 500 m length of pipe. Find the power required to maintain this flow. (9M)
4. a) Obtain an expression for the force exerted by a jet of water on a fixed vertical plate in the direction of the jet. (6M)  
b) A jet of water of diameter 100 mm moving with a velocity of 30 m/s strikes a curved fixed symmetrical plate at the center. Find the force exerted by the jet of water in the direction of the jet, if the jet is deflected through an angle of 120° at the outlet of the curved plate. (9M)

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5. a) Explain load factor, utilization factor and capacity factor. What is the significance of them? (8M)
- b) The average annual yield of a river at a dam site is 2000 ha-m. Assuming that the entire yield is available for power generation, estimate the water power potential. The average net head available is 52 m. Also estimate the available energy. Take efficiency of turbine as 80% and the efficiency of the generator as 90%. (7M)
6. A Francis turbine is fitted with a straight conical draft tube of height 6 m and diameters 1 m at top and 2 m at bottom. The draft tube is submerged in the tail race to a height of 1.5 m. The velocity of water at the draft tube inlet is 6 m/s. Assume that the friction head lost in tube is 0.125 times the velocity head at inlet. Compute the efficiency of the draft tube and the vacuum pressure of water at the draft tube inlet. What is the head and power saved by the draft tube? (15M)
7. a) Derive the equation of unit speed and unit discharge of a turbine. (7M)
- b) What is cavitation? How can it be avoided in reaction turbine? (8M)
8. a) Discuss the detailed classification of pumps (7M)
- b) What precautions are to be taken while starting and closing the pump? (8M)