

Code No: R1621034

R16**SET - 1****II B. Tech I Semester Supplementary Examinations, May - 2019****FLUID MECHANICS & HYDRAULIC MACHINES**

(Com to ME & Mining Engineering)

Time: 3 hours

Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)2. Answer **ALL** the question in **Part-A**3. Answer any **FOUR** Questions from **Part-B**

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**PART -A**

1. a) If the pressure at appoint below the sea is  $137.7 \text{ KN/m}^2$  what is the pressure (3M)  
30m below this point. Specific weight of ocean water is  $10.06 \text{ KN/m}^2$ .
- b) Write the difference between steady flow and uniform flow (2M)
- c) Name some dimensionless numbers. (2M)
- d) What are the forces exerted by a jet on moving plates. (2M)
- e) Write a note on NPSH. (3M)
- f) What is the example for Impulse Turbine? (2M)

**PART -B**

2. a) Differentiate between U-tube and Differential Manometer With a neat sketch. (7M)
- b) Calculate the shear stress developed in oil of viscosity 1.4 poise, used for lubricating the clearance between a shaft of diameter 15 cm and its journal bearing. The shaft rotates at 175 rpm and clearance is 1.5 mm. (7M)
3. a) The velocity potential function is given by  $\phi = 4(x^2 - y^2)$ . Calculate the velocity components at the point (2, 3). (6M)
- b) State the momentum equation; In what way does it differ from impulse momentum equation. Mention some of its engineering applications. (8M)
4. a) Explain the significance of dimensionless numbers in dimension analysis. (6M)
- b) Find the displacement thickness, the moment thickness and the energy thickness for the velocity distribution in the boundary given by  $u/U = (y/\delta)^{0.22}$  where u is the velocity at a distance y from the plate and  $u=U$  at  $y=\delta$ , where  $\delta$  = boundary layer thickness. (8M)
5. a) Obtain an expression for the force exerted by a jet of water on a fixed vertical plate in the direction of the jet. (7M)
- b) A jet of water of diameter 60 mm moving with a velocity of 25 m/s strikes a fixed plate in such a way that the angle between the jet and the plate is  $55^\circ$ . Find the force exerted by the jet on the plate (i) in the direction normal to the plate, and (ii) in the direction of the jet. (7M)



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6. a) The internal and external diameters of the impeller of a centrifugal pump are 200 mm and 400 mm respectively. The pump is running at 1200 r.p.m. The vane angles of the impeller at inlet and outlet are  $20^\circ$  and  $30^\circ$  respectively. The water enters the impeller radially and velocity of flow is constant. Determine the work done by the impeller per unit weight of water. (8M)
- b) Compare Reciprocating pump with Centrifugal pump. (6M)
7. a) A Pelton wheel generates 8000KW under a net head of 130 m at a speed of 200 rpm. Assuming the coefficient of velocity for the nozzle 0.98, hydraulic efficiency 87%, speed ratio 0.46 and jet diameter to wheel diameter ratio is  $1/9$ . Determine (8M)
- (i) Discharge required (ii) Diameter of the wheel  
(iii) Diameter and number of jets required  
(iv) Specific speed; Mechanical efficiency is 75%
- b) Define the term 'Governing of a turbine'. Describe with a neat sketch the working of an oil pressure governor. (6M)

