

IV- SEM/ MECH./DME/MECH.(PROD)/MECH(IND.INT)/ 2019(W)

MET-404 FLUID MECHANICS & HYDRAULIC MACHINES

Full Marks: 80

Time : 3 Hours

Answer any FIVE Questions including Q No. 1 & 2

Figures in the right hand margin indicates marks

1.	<p>Answer ALL the questions in brief:</p> <ol style="list-style-type: none"> Define specific weight and state its unit. What is surface tension? Mention its unit. Define Total pressure and Centre of pressure Define steady flow and uniform flow. Define hydraulic gradient line and total energy line. Distinguish between impulse and reaction turbine. State the Bernoulli's equation. List the causes of minor energy losses due to flow of fluid in a pipe. Define and classify pumps. What are slip and negative slip of pumps? 	2X10
2.	<p>Answer any SIX questions</p> <ol style="list-style-type: none"> A simple U-tube manometer containing mercury is connected to a pipe in which a fluid of sp. gr. 0.8 and vacuum pressure is flowing. The other end of the manometer is open to the atmosphere. Find the vacuum pressure in pipe, if the difference of mercury level in the two limbs is 40 cm and the height of fluid in the left from the centre of pipe is 15 cm below. A body of dimensions 1.5 m X 1 m X 2 m weighs 1962 N in water. Find its weight in air. What will be its specific gravity? The diameters of a pipe at the sections 1 and 2 are 10 cm and 15 cm respectively. Find the discharge through the pipe if the velocity of water flowing through the pipe at section 1 is 5 m/s. Determine also the velocity at section 2. Explain various hydraulic co-efficients and establish the relation among them. The pressure intensity at a point in a fluid is given 3.924 N/cm². Find the corresponding height of fluid when the fluid is: (a) water (b) oil of sp. gr. 0.9. Explain the concept of multistage centrifugal pumps. A nozzle of 50 mm diameter delivers a stream of water at 20 m/s perpendicular to a flat plate that moves away from the jet at 5 m/s. Find the force exerted by the jet on the plate and work done per second. 	5X6
3.	<p>A Pelton wheel has a mean bucket speed of 10 m/s with a jet of water flowing at the rate of 700 lit/s under a head of 30 meters. The buckets deflect the jet through an angle of 160°. Calculate the Runner power and hydraulic efficiency of the turbine. Take $C_v = 0.98$.</p>	10

4.	An oil of sp. gr. 0.9 and viscosity 0.06 poise is flowing through a pipe of diameter 200 mm at the rate of 60 litres/s. Find the head lost due to friction for a 500 m length of pipe. Find the power required to maintain this flow.	10
5.	A horizontal venturimeter with inlet diameter 20 cm and throat diameter 10 cm is used to measure the flow of oil of specific gravity 0.8. The discharge of oil through venturimeter is 60 litres/s. Find the reading of the oil-mercury differential manometer. $C_d=0.98$.	10
6.	What is a reciprocating pump? Describe the working principle of single acting reciprocating pump with neat sketch. Derive the power required to drive the pump.	10
7.	A rectangular plane surface is 2 m wide and 3 m deep. It lies in vertical plane in water. Determine the total pressure and position of centre of pressure on the plane surface when its upper edge is horizontal and (a) coincides with water surface (b) 2.5 m below the free water surface.	10