Sub Code: R2322034 **R23** **Set No. 1**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY-GURUJADA VIZIANAGARAM
II B. Tech II Semester Supplementary Examinations NOV-2025
FLUID MECHANICS & HYDRAULIC MACHINES
(ME)

Time: 3 hours **Max. Marks: 70**

The Question paper consists of Part A & Part B.
Part A is compulsory, Answer all questions.
Part B Answers any one question from each unit.
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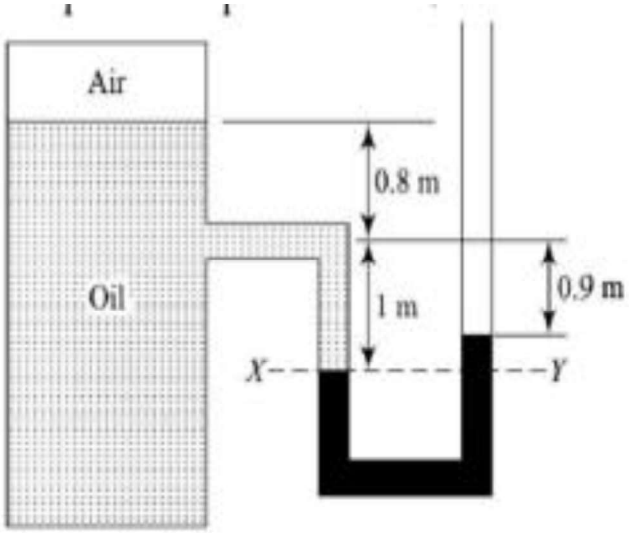
		PART-A	(20Marks)
1	a)	Define surface tension. What type of forces involves in the surface tension	[2]
	b)	List the essential properties of mercury to be used a manometric liquid	[2]
	c)	State the difference between the source and sink	[2]
	d)	Write the condition for irrotational flow	[2]
	e)	Illustrate the characteristics of stream line body	[2]
	f)	What is meant by dimensional homogeneity	[2]
	g)	Define the draft tube efficiency	[2]
	h)	Write the expressions for the work done and Force exerted by the jet on the moving inclined plate.	[2]
	i)	State the reasons for the pumps to be connected in the series	[2]
	j)	Mention the advantages of reciprocating pumps	[2]
		PART-B	(50Marks)
		Question from **Unit - I**	
2	a)	Oil of specific gravity 0.8 is stored in a closed tank up to a certain height. Air is entrapped at the top portion of the tank above oil. While one end of a U-tube mercury manometer is connected to the tank, the other end is open to the atmosphere as shown in Figure. Determine the air pressure in the tank. Assume specific weights of mercury and water as 133.28 kN/m^3 and 9.80 kN/m^3 respectively. Take atmospheric air pressure as 101 kPa.	[5]



	b)	Find the density of a metallic body which floats at the interface of mercury of sp.gr. 13.6 And water such that 40% of its volume is sub-merged in mercury and 60% in water	[5]

(OR)

3		A horizontal pipe line is 40m long is connected to a water tank at one end and discharges freely into the atmosphere at the other end. For the first 25m of its length from the tank, the pipe is 150mm diameter and its diameter is suddenly enlarged to 300mm. The height of water level in the tank is 8m above the Centre of the pipe. Considering all losses of head which is occur, determine the rate of flow. Take f=0.01 for both sections of the pipe.	[10]
		Question from **Unit - II**	
4	a)	If for a two – diamantine potential flow, the velocity potential is given by $\phi = x(2y-1)$. Determine the velocity at the point P(4,5). Determine also the value of stream function Ψ at the point P.	[5]
	b)	A 0.25m diameter pipe carries oil of specific gravity 0.8 at the rate of 120 litres per second and the pressure at a point A is 19.62 kN/m^2 (gage). If the point A is 3.5m above the datum line, Calculate the total energy at point A in meters of oil.	[5]
		(OR)	
5		Define major and minor energy losses in pipes. Using Bernoulli's equation, obtain an expression for loss of head due to sudden expansion of pipe.	[10]
		Question from **Unit - III**	
6	a)	Derive the expressions for the displacement thickness and energy thickness	[5]
	b)	What are the methods to be taken for the control of separation of boundary layer	[5]
		(OR)	
7		The efficiency of a fan depends on density, viscosity of the fluid, angular velocity, diameter of rotor and discharge. Express in terms non dimensional parameters using Buckingham's theorem	[10]
		Question from **Unit - IV**	
8		A 50 mm diameter water jet having a velocity of 20 m/s impinges on a curved vane which is moving in the same direction as that of the jet with a velocity of 5 m/s. The jet leaves the vane at an angle of 150° with the direction of motion of vane. Neglecting friction find the following (i) the force exerted by the jet in the direction of motion of the vane (ii) the power developed by the jet (iii) the efficiency of the vane.	[10]
		(OR)	
9		Obtain an expression for the work done per unit time by water on the runner of a Pelton wheel. Also obtain an expression for the maximum efficiency of the Pelton wheel.	[10]
		Question from **Unit - V**	
10		A centrifugal pump rotating at 1000 r.p.m delivers 160 litres/s water against a head of 30m. The pump is installed at a place where atmospheric pressure is 10^5 Pa(abs.). and vapour pressure of water is 3 kPa(abs.). The head loss in suction pipe is equivalent to 0.2 m of water, Calculate i) Minimum NPSH and ii) Maximum allowable height of the pump from free surface of water in the sump.	[10]
		(OR)	
11		The diameter and stroke of a single acting reciprocating pump are 200 mm and 400 mm respectively, the pump runs at 60 rpm and lifts 12 liters of water per second through a height of 25 m. The delivery pipe is 20m long and 150mm in diameter. Find (i) Theoretical power required to run the pump (ii) Percentage of slip. (iii) Acceleration head at the beginning and middle of the delivery stroke.	[10]

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