Code No: R1921013 **R19** SET - 1

II B. Tech I Semester Regular Examinations, March - 2021
FLUID MECHANICS
(Civil Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions each Question from each unit
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~

1 a) Explain about atmospheric, gauge and vacuum pressure. [8M]

b) A simple U-tube manometer containing mercury is connected to a pipe in which a fluid of specific gravity 0.8 and having vacuum pressure is flowing. The other end of the manometer is open to 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 15cmbelow. [7M]

Or

2 a) Explain the working of Micro manometers with neat sketch. [8M]

b) A differential manometer is connected to two pipes whose centers are at 3m difference in height. Higher level pipe is carrying liquid of specific gravity of 0.9 at a pressure of 1.8 bar and another pipe is carrying liquid at specific gravity of 1.5 at a pressure of 1 bar. The centre of pipe carrying low pressure liquid is 2m above the higher level of the mercury in the manometer. Find out the difference in mercury level in the manometer in cm. [7M]

3 a) Derive Bernoullis equation and state assumptions [8M]

b) The water is flowing through a pipe having diameters 20cm and 10cm at sections 1 and 2 respectively. The rate of flow through pipe is 35litres/s. The section 1 is 6m above datum and section 2 is 4m above datum. If the pressure at section 1 is 3924N/cm^2 find the intensity of pressure at section 2. [7M]

Or

4 a) Discuss the continuity equation for 3D flow. [8M]

b) A horizontal venturimeter with inlet and throat diameters 40cms and 20cms respectively is used to measure the flow of water. The reading of differential Manometer connected to the inlet and throat is 18 cm of mercury. Determine the rate of flow. Take Cd=0.97 [7M]

5 A pipe line ABC 180 m long is laid on an upward slope of 1 in 60. The length of portion AB is 90 m and its diameter is 0.15 m. At B the pipe section suddenly enlarges to 0.30 m diameter and remains so for the remainder of its length BC, 90m. A flow of 50 liters per second is pumped into the pipe at its lower end A and is discharged at the upper end C into a closed tank. The pressure at the supply end A is 137.34 kN/m^2. Sketch [15M]
(a) the total energy line
(b) the hydraulic gradient line and also find the pressure at discharge end C. Take f = 0.02 in $h_f = \frac{flv^2}{2gD}$

Or
~~~~~~~~~~~~~~~~~~~~~~~~~

6 A pipeline of 600 mm diameter and a 4km length connects two reservoirs. The difference of water levels in the reservoirs is 20 m. At a distance of 1 km from the upper reservoir, a small pipe is connected to the pipelines. The water can be taken from the small pipe. Find the discharge to the lower reservoir if [15M]

(i) No water is taken from the small pipe, and

(ii) 0.1 m^3 /s of water is taken from small pipe. Take coefficient of friction =0.005 and neglect minor losses.

7 a) What is Notch? How are the notches classified? [7M]

b) Find the discharge through a triangular notch under a constant head of 0.25m if the angle of the notch is 1200. Take Cd=0.62. [8M]

Or

8 a) Discuss the various empirical formulae for discharge over weirs? [8M]

b) A rectangular weir is 2m long and has a head of 0.675m. Find the discharge taking into account two end contractions. [7M]

9 a) What are different types of drag? What is streamlining? What is its effect on the Different types of drag? [8M]

b) Explain laminar boundary layer over a thin flat plate. [7M]

Or

10 a) What do you understand by turbulent flow? What factors decides the type of flow in pipes? [8M]

b) A plate of 600mm length and 400mm wide is immersed in a fluid of G=0.9 and kinematic viscosity V=$10^{-4}m^2$/s. The fluid is moving with a velocity of 6m/s. Find boundary layer thickness and shear stress at the end of the plate. [7M]

Code No: R1921013 **R19** SET - 2

II B. Tech I Semester Regular Examinations, March - 2021
FLUID MECHANICS
(Civil Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions each Question from each unit
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~

1	a)	A tank has a base 4m square from which four side slope outward at 45^0 to the horizontal for a vertical height of 3m they then turn vertically upward for another 3m. The tank is filled with water of full depth of 6m. Find the total pressure and centre pressure on one of the sloping sides of the tank	[8M]
	b)	Define capillarity and surface tension and discuss the factors affecting them.	[7M]
		Or	
2	a)	Explain with sketches how an inverted U-tube manometer is used to measure small pressure differences	[8M]
	b)	Explain the importance of vapour pressure in fluid mechanics.	[7M]
3	a)	What do you understand by turbulent flow? What factors decides the type of flow in pipes?	[8M]
	b)	Water is flowing through a rough pipe of diameter 40cm and length 3000m at the rate of 0.4 m^3/s. Find the power required to maintain this flow. Take the Average height of roughness of K = 0.3mm.	[7M]
		Or	
4	a)	A horizontal venturimeter with inlet diameter 20cm and throat diameter 10cm is used to measure the Flow of oil of Sp. gr. 0.8. The discharge of oil through venturimeter is 60liters/s. Find the reading of the oil-mercury differential manometer. Take Cd=0.98	[8M]
	b)	Explain about flow net analysis	[7M]
5	a)	Derive Darcy-Weisbach equation for loss of head in apipe	[8M]
	b)	Explain about Total energy line and hydraulic gradient line	[7M]
		Or	
6		The difference in water surface levels in two tanks, which are connected by three pipes in series of lengths 300m, 170m, and 210m and of diameters 300mm, 200mm and 400mm respectively is 12m. Determine the rate of flow of water if co-efficient of friction are 0.005, 0.0052 and 0.0048 respectively. Considering: (i) minor losses (ii) neglecting minor losses.	[15M]
7	a)	Give a brief note on crested weirs and ogee weirs.	[7M]
	b)	What is an orifice meter? Give the classification of orifices and their applications.	[8M]
		Or	
~~~~~~~~~~~~~~~~~~~~~~~~~

8 a) Define velocity of approach. How can you account for it while computing the discharge over weirs? [8M]

b) Discuss the character tics of flow over Triangulal and trapezoidal notches? [7M]

9 a) What do you understand by Boundary Layer? Explain the development of Boundary layer over a flat plate [8M]

b) It is required to determine the frictional drag of a submarine. The length of the hull is 75m and its surface area is $3000m^2$. The submarine is travelling at a constant speed of 5m/s. critical Reynolds number at which the flow in the boundary layer changes from laminar to turbulent is 5×10^5 . Assuming that the boundary layer at the leading edge is laminar, obtain the frictional drag and the power required to propel the submarine at 5m/s. Take $V=1 \times 10^{-6} m^2$ /s and $P=1000kg/m^3$. [7M]

Or

10 a) Derive Von Karman momentum integral equation. [8M]

b) What do you mean by boundary layer separation? What is the effect of pressure gradient on boundary layer separation? [7M]

Code No: R1921013 **R19** SET - 3

II B. Tech I Semester Regular Examinations, March - 2021
FLUID MECHANICS
(Civil Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions each Question from each unit
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~

1	a)	Distinguish between simple manometer and a differential manometer.	[8M]
	b)	Calculate the specific weight, specific mass, specific volume and specific gravity of a liquid having a volume of 6 m^3 and weight of 44 kN.	[7M]
		Or	
2	a)	Show that the rate of increase of pressure in a vertical direction in a fluid at rest is equal to the weight density of the fluid at that point.	[8M]
	b)	A vertical cylinder of diameter 180 mm rotates concentrically inside another cylinder of diameter 181.2 mm. The space between the cylinder is filled with the oil whose viscosity is 8 poise. Find out the power required to rotate the cylinder at 100 rpm	[7M]
3	a)	Mention the different forces in a fluid flow. For the Euler's s equation of motion, which force are taken into consideration.	[8M]
	b)	What are the applications of Momentum equation? Explain.	[7M]
		Or	
4		Distinguish between: (i) Steady flow and un-steady flow, (ii) Uniform and nonuniform flow, (iii) Compressible and incompressible flow, (iv) Rotational and irrigational flow (v) Laminar and turbulent flow.	[15M]
5	a)	Discuss the characteristics of laminal &Turbulent flows.	[7M]
	b)	Define minor losses in pipes and obtain equation for any four losses.	[8M]
		Or	
6		Explain how the following flow problems are analyzed. i) Series pipe connection (ii) parallel pipe connection and iii) Equivalent pipe connection	[15M]
7	a)	A right angled V-notch is used for measuring a discharge of 30 l/s. an error of 2mm was made in measuring the head over the notch. Calculate the percentage error. Take C_d=0.62.	[7M]
	b)	Write briefly and Sketch neatly the following i) Venturimeter, ii) Pitot tube and iii) Orifice meter.	[8M]
		Or	
~~~~~~~~~~~~~~~~~~~~~~~~~

8 a) A 150mm X 75mm Venturi meter with a coefficient of discharge 0.98 is to be replaced by an orifice meter having a coefficient of discharge 0.60. If the both the meters are to give the same differential mercury manometer reading for a discharge of 100 liters per second and the inlet diameter is to remain 150mm. what should be diameter of the orifice? [8M]

b) What is a weir? How are weirs classified? Discuss with neat sketch. [7M]

9 Explain the concept of boundary layer? What is the importance of boundary layer in fluid flow problems? Derive Von Karman momentum integral equation. [15M]

Or

10 Define boundary layer and explain the fundamental causes of its existence. Also discuss the various methods of controlling the boundary layer. [15M]

Code No: R1921013 **R19** SET - 4

II B. Tech I Semester Regular Examinations, March - 2021
FLUID MECHANICS
(Civil Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions each Question from each unit
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~

1	a)	What is the importance of a manometer? Explain the types of manometers in brief.	[8M]
	b)	Explain the term total pressure acting on a plane surface immersed in a fluid at any angle. Obtain an expression for this, and also for the corresponding depth of the centre of pressure.	[7M]
		Or	
2	a)	A U-tube manometer is used to measure the pressure of oil of specific gravity 0.85 flowing in a pipe line. Its left end is connected to the pipe and the right limb is open to the atmosphere. The centre of the pipe is open to the atmosphere. The centre of the pipe is 100mm below the level of mercury (specific gravity=13.6) in the right limb. If the difference of mercury level in the two limbs is 160mm, determine the absolute pressure of the oil in the pipe	[8M]
	b)	State and explain the Newton‘s law of viscosity. Deduce the expression for the dynamic viscosity.	[7M]
3	a)	Describe the procedure of finding the forces on pipe bend.	[8M]
	b)	What are the surface and body forces associated with fluid flow? How are they incorporated in Euler’s equation?	[7M]
		Or	
4	a)	Derive the equation of continuity for one dimensional flow of an incompressible fluid	[8M]
	b)	Derive the equation of continuity for two dimensional flow.	[7M]
5	a)	Explain how Reynold’s experiment is conducted in the lab and bring its practical uses.	[8M]
	b)	Derive an expression for the loss of head due to friction in flow through circular pipes.	[7M]
		Or	
6	a)	The cross section of a pipe carrying a given discharge is suddenly enlarged. What would be the ratio of the two diameters of the pipe if the magnitude of the loss of head at this change of section is same irrespective of the direction of flow? Assume CC = 0.64.	[8M]
	b)	What are hydraulic grade line and total energy line? How do you draw the same?	[7M]
7	a)	Petroleum oil(sp.gr 0.93 and viscosity =13cP) Flows isothermally through a horizontal 5 cm pipe. A Pitot tube is inserted at the centre of a pipe and it leads are filled with the same oil and attached to a U-tube containing water. The reading on the manometer is 10 cm. Calculate the volumetric flow of oil in m 3 /s. The coefficient of Pitot is 0.98.	[8M]
	b)	Explain the working of Pitot tube. Derive an expression for measurement of velocity by Pitot tube.	[7M]
		Or	
~~~~~~~~~~~~~~~~~~~~~~~~~

8 a) A Venturimeter has its axis vertical, the inlet and throat diameters being 150mm and 80 mm respectively. The throat has 220mm about inlet and coefficient discharge is 0.96. Petrol of specific gravity 0.78 flows up through the meter at a rate of 0.029 m^3 /s. Find the pressure difference between the inlet and the throat. [8M]

b) Determine the expression for rate of flow through the venturimeter? [7M]

9 a) What are the different methods of preventing the separation of boundary layers? [8M]

b) Define laminar boundary layer, turbulent boundary layer, laminar sub layer and boundary layer thickness? [7M]

Or

10 a) A 2m wide and 5.0 m long plate when towed through water at 20^0C experiences a drag of 30.38 N on both the sides. Determine the velocity of the plate and the length over which the boundary layer is laminar. [8M]

b) How will you find the drag on a flat plate due to laminar and turbulent boundary layers? [7M]