Q.P. Code: 18CE0104 **R18**

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SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR

(AUTONOMOUS)

B.Tech II Year I Semester Supplementary Examinations December-2021

INTRODUCTION TO FLUID MECHANICS

(Common to AGE & CE)

Time: 3 hours Max. Marks: 60

PART-A

(Answer all the Questions **5 x 2 = 10** Marks)

1	a	Differentiate dynamic viscosity and kinematic viscosity	L1	2M
	b	Classify lines of flow and define	L2	2M
	c	State momentum principle and its applications	L1	2M
	d	Define total energy line and hydraulic gradient line	L1	2M
	e	Sketch Moody's diagram	L2	2M

PART-B

(Answer all Five Units 5 x 10 = 50 Marks)

UNIT-I

2	a	Define specific density and specific weight, viscosity, vapour pressure and cavitation.	L1	5M
	b	The space between two square flat parallel plates is filled with oil. Each side of the plate is 60 cm. The thickness of the oil film is 2.5mm. The upper plate, which moves at 2.5 m/sec, requires a force of 9.81N to maintain the speed. Determine dynamic viscosity of the oil in poise and kinematic viscosity of oil if specific gravity of oil is 0.95.	L2	5M

OR

3	a	Define Manometer. Briefly, explain the types of manometers in detail.	L1	5M
	b	What is the gauge pressure at a point 3m below the free surface of a liquid having a density 1.53 x 103 kg/m^3 .If the atmospheric pressure is equivalent to 750mm of mercury? The Specific gravity of mercury is 13.6 and density of water = 1000 kg/m^3	L2	5M

UNIT-II

4	a	Obtain an expression for continuity equation for a three - dimensional flow	L1	5M
	b	The velocity vector in a fluid flow V= $4x^3i-10x^2yj+2tk$, find the velocity and acceleration of a fluid particle at (2, 1, 3) at time t=1	L2	5M

OR

5	a	Write a short notes on the following i) Equipotential line ii) Line of constant stream function iii) Flow net	L1	5M
	b	If for a two – dimensional potential flow, the velocity potential is given by Ø = x(2y – 1). Determine the velocity at the point p (4, 5). Determine also the value of stream function Ψ at the point p.	L2	5M

UNIT-III

6	a	State Bernoulli's theorem for steady flow of an incompressible fluid. Derive the expression for Bernoulli's theorem from first principle and state the assumption made for such a derivation	L1	5M
	b	A horizontal venture meter with 30cm diameter inlet and 10cm throat is used for measuring the flow of water through a pipeline. If pressure in pipe is 1.5kpa and the vacuum pressure at the throat is 40cm of mercury, calculate the rate of flow. It may be presumed that 5% of differential head is lost between the pipe main and the throat section. Also make calculations for the discharge co-efficient take specific weight of water = 10kN/m3	L2	5M

OR

7	a	Explain Pitot tube with neat sketch.	L1	6M
	b	A sub-marine moves horizontally on a sea and has its axis 15m below the surface of water. A pitot tube properly placed just in front of a sub-marine and along its axis is connected to two limbs of a u – tube-containing mercury. The difference of mercury level is found to be 170mm find the speed of the sub-marine knowing that the specific gravity of mercury is 13.6 and that of sea water is 1.026 with respect of fresh water 5m	L2	4M

UNIT-IV

8	a	Derive the expression for head loss in pipes due to friction by Darcy - Weisbach equation and Chezy's formula	L1	6M
	b	A horizontal pipe of diameter 500mm is suddenly contracted to a diameter of 250mm. The pressure intensity in the larger and smaller pipe is given as 13.734 N/cm2 and 11.772 N/cm2 respectively. Find the head lost due to contraction if CC is 0.63. Also determine the rate of flow of water?	L2	4M

OR

9	a	Derive the expression for flow through parallel pipes.	L1	5M
	b	Find the loss of head when a pipe of diameter 200 mm is suddenly enlarged to a diameter of 400 mm. The rate of flow of water through the pipe is 250 lit/s.	L2	5M

UNIT-V

10	a	Derive the expression for maximum velocity for a Laminar flow through circular pipes?	L1	5M
	b	An oil of viscosity 0.1 Ns/m2 and relative density 0.9 is flowing through a circular pipe of diameter 50mm and length 300 m. The rate of flow of fluid through a circular pipe is 3.5 lit/sec. Find the pressure drop in a length of 300m and the shear stress at the pipe wall?	L2	5M

OR

11	a	Derive the equation for the flow of viscous fluid between two parallel plates? When plates are fixed	L1	5M
	b	For a turbulent flow in a pipe diameter 300mm, find the discharge when centerline velocity is 2m/s & velocity at appoint 100mm from center is 1.6m/s.	L2	5M

END