

**B. TECH**  
**(SEM-III) THEORY EXAMINATION 2019-20**  
**FLUID MECHANICS**

Time: 3 Hours

Total Marks: 100

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

## SECTION A

1. Attempt all questions in brief. 2 x 10 = 20

Qno.	Question	Marks	CO
a.	Define weight density.	2	1
b.	Define Piezometer with neat sketch.	2	1
c.	What are stream tube?	2	2
d.	What do you understand by Rate of flow?	2	2
e.	Write practical application of Bernoulli's equation.	2	3
f.	Draw the neat sketch of venturimeter.	2	3
g.	Define stokes's Law.	2	4
h.	Distinguish between rotational and irrotational flow.	2	4
i.	What are the Magnus effects?	2	5
j.	What is flow separation?	2	5

## SECTION B

2. Attempt any three of the following: 3 x 10 = 30

Qno.	Question	Marks	CO
a.	Given that : Barometer reading =740 mm of mercury, specific gravity of mercury =13.6 , intensity of pressure =40 kPa. Express the intensity of pressure in S.I. units, both gauge and absolute.	10	1
b.	Sketch the velocity distribution for uniform irrotational flow.	10	2
c.	Find an expression for the discharge over a rectangular notch in terms of head of water over the crest of the notch.	10	3
d.	Prove that viscous flow through a circular pipe the kinetic energy correction factor equal to 2.	10	4
e.	Give and explain the five errors in CFD and give examples. How can they be determined and reduced?	10	5

## SECTION C

3. Attempt any one part of the following: 1 x 10 = 10

Qno.	Question	Marks	CO
a.	A crude oil of viscosity 0.97poise and relative density= 0.9 is flowing through a horizontal circular pipe of diameter 100mm and length 10m. Calculate the difference of pressure at two of the pipe, if 100kg of the oil is collected in tank in 30seconds.	10	1
b.	Explain briefly the following types of equilibrium of floating bodies (i) Stable Equilibrium (ii) Unstable Equilibrium (iii) Neutral Equilibrium	10	1

Paper Id: Roll No: **4. Attempt any one part of the following: 1 x 10 = 10**

Qno.	Question	Marks	CO
a.	Write examples of viscous flow and explain the characteristics of Laminar flow.	10	2
b.	Find the velocity and acceleration at a point (1,2,3) after 1 sec. for a three dimensional flow given by $u=yz+t$ , $v=xz-t$ , $w=xy$ m/s	10	2

**5. Attempt any one part of the following: 1 x 10 = 10**

Qno.	Question	Marks	CO
a.	A horizontal pipe of diameter 450 mm is suddenly contracted to a diameter of 200 mm. The pressure intensities in the large and smaller pipe is given as 13.734N/cm <sup>2</sup> and 11.774 N/cm <sup>2</sup> respectively. Find the loss of head due to contraction if $C_c=0.62$ . Also determine the rate of flow of water.	10	3
b.	Derive an expression for the power transmission through the pipes. Find also the condition of power and corresponding efficiency of transmission	10	3

**6. Attempt any one part of the following: 1 x 10 = 10**

Qno.	Question	Marks	CO
a.	If velocity distribution in laminar boundary layer a flat plate is assumed to be given by second order polynomial $u=a+by+cy^2$ . Determine its form using the necessary boundary conditions.	10	4
b.	Prove that in case of force vortex, the rise of liquid level at the ends is equal to the full liquid level at the axis of rotation.	10	4

**7. Attempt any one part of the following: 1 x 10 = 10**

Qno.	Question	Marks	CO
a.	What is meant by geometric, kinematic and dynamic similarities? Are these similarities truly attainable? If is not why?	10	
b.	A 1:40 model of ocean tanker is dragged through fresh water at 2m/s with total measured drag of 117.7 N. The skin (frictional) drag coefficient 'f' for model and prototype are 0.3 and 0.02 respectively in the equation $R_f=fAV^2$ . The water surface area of the model is 25m <sup>2</sup> . Taking the densities for the prototype and the model as 1030 kg/m <sup>3</sup> and 1000 kg/m <sup>3</sup> respectively, Determine (i) The total drag on the prototype (ii) Power required to drive the prototype.	10	