Sub Code:KCE303

Paper Id: 100323 Roll No:

**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 venutrimeter. | 2 | 3 |
| g. | Define stokes's Law. | 2 | 4 |
| h. | Distinguish between ratational and irrotaional 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 |

**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 pont (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$^2$ and 11.774 N/cm$^2$ 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 co-efficient '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$^2$. Taking the densities for the prototype and the model as 1030 kg/m$^3$ and 1000 kg/m$^3$ respectively, Determine (i) The total drag on the prototype (ii) Power required to drive the prototype. | 10 | |