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**Question Paper Code : 53105**

B.E./B.Tech. DEGREE EXAMINATION, APRIL 2019

Civil Engineering

15UCE305 FLUID MECHANICS

(Regulation 2015)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

- Density is the ratio of mass to CO1- R  
(a) Weight (b) Volume (c) Gravity (d) capillarity
- The unit for specific gravity is CO2- R  
(a) cm (b) m/s (c) No Unit (d) KN/m
- Venturimeter is used to find \_\_\_\_\_ of water. CO3-U  
(a) Weight (b) Discharge (c) Capillarity (d) All the above
- The following one is not the minor loss in a pipe flow CO4- U  
(a) Loss of head due bend (b) loss of head due to contraction (c) Loss of head due to friction (d) ) Loss of head due to obstruction
- Reynolds number is used to find out CO5- R  
(a) Type of flow (b) head loss (c) Volume of liquid (d) Dimension

PART – B (5 x 3= 15Marks)

- Explain about metacenter and metacentric height. CO1- R
- Write the assumptions made in Bernoulli's equation CO2- U
- Define displacement thickness. CO3- U
- List the minor losses. CO4- R
- Write the dimensions of Velocity , Force and Viscosity. CO5- U

PART – C (5 x 16= 80Marks)

11. (a) A Newtonian fluid of Kinematic viscosity 2.528 stokes flows over a flat horizontal plate of surface area  $0.8\text{m}^2$ . Velocity at  $y$  meters from plate is given as  $u = 2y - 2y^3$  in m/s. If the shear force on plate is 0.352N, Find specific weight and gravity of the liquid. CO1- Ana (16)

Or

- (b) Determine the intensity of shear of an oil having viscosity=1Poise. The oil is used for lubricating the clearance between a shaft of diameter 10cm and its journal bearing. The clearance is 1.5mm and the shaft rotates at 150rpm. CO1- E (16)
12. (a) (i) Explain stream function and velocity potential function CO2- R (6)  
(ii) A 30 cm diameter pipe , conveying water , branches into two pipes of diameters 20cm and 15cm resp. . If the average velocity in the 30cm diameter pipe is 2.5m/s, find the discharge in this pipe . Also determine the velocity in 15cm pipe , if the average velocity in 20 cm diameter pipe is 2m/s CO2- Ana (10)

Or

- (b) A 20cm x10cm venturimeter is inserted in a vertical pipe carrying an oil of specific gravity 0.8, the flow of an oil is upward direction. The difference of levels between the throat and the inlet section is 50cm. The oil mercury differential manometer gives a reading of 30cm of mercury. Find the discharge of oil. CO2- E (16)
13. (a) Derive the equation for energy thickness and displacement thickness. CO3- Ana (6)

Or

- (b) Find the displacement thickness , momentum thickness and energy thickness for a velocity distribution in the boundary given by  $u/U = y/\delta$ , where  $u$  is the velocity at a distance of  $y$  from the plate ,  $u = U$  at  $y = \delta$  where  $\delta$  is the boundary layer thickness CO3- E (16)
14. (a) (i) Explain pipes in parallel and pipes in series CO4- U (6)  
(ii) Find the head loss when a pipe of diameter 200mm is suddenly enlarged to 400mm. The rate of flow through the pipe is  $0.250\text{m}^3/\text{s}$  CO4 -U (10)

Or

- (b) A crude oil of viscosity 0.97 poise and relative density 0.9 is flowing through a horizontal circular pipe of diameter 100mm and of length 10m. Calculate the difference of pressure at the two ends of the pipe, if 100kg of the oil is collected in a tank in 30 seconds. CO4- Ana (16)
15. (a) (i) Summarize in detail the procedure followed in selecting the repeating variables. CO5- R (8)
- (ii) Describe the different types of similitudes. CO5- R (8)
- Or
- (b) Prove that the efficiency of fan  $\eta = \Phi [ \mu/D^2 \rho w, Q/D^2 w ]$  where it depends upon density  $\rho$ , dynamic viscosity  $\mu$ , angular velocity  $w$ , diameter  $D$ , and discharge  $Q$ . CO-5 App (16)

