

**B.E. / B.TECH. DEGREE EXAMINATIONS, DEC 2019**

Third Semester

CE16302 – MECHANICS OF FLUIDS*(Civil Engineering)***(Regulation 2016)****Time: Three Hours****Maximum : 100 Marks**

Answer ALL questions

PART A - (10 X 2 = 20 Marks)

	CO	RBT
1. Define Bulk modulus and mass density of a fluid.	1	R
2. Write the statement for Pascal's Law.	1	R
3. Differentiate laminar flow and turbulent flow.	2	U
4. Write Bernoulli equation.	2	R
5. What are various types of losses in a pipe flow?	3	R
6. What is the relation between Darcy equation and Hagen Poiseuille equation	3	U
7. What are the methods of preventing the separation of boundary layers?	4	R
8. Define the terms Drag and lift.	4	R
9. What are the fundamental dimensions in a Dimensional Analysis?	5	R
10. Define undistorted models.	5	R

PART B - (5 X16 = 80 Marks)

11. (a) A liquid has a specific gravity of 0.72. Find its density, specific weight and weight per litre of the liquid. If the above liquid is used for lubrication between shaft and sleeve, find the power lost in liquid for a sleeve length of 100mm. The diameter of shaft is 0.5m and thickness of liquid film is 1mm. Take the viscosity of liquid as 0.5 Pa –s. and speed of shaft as 200 rpm. (16) 1 AP

(OR)

- (b) A tank contains water upto a height of 1 m above the base. An immiscible liquid of specific gravity 0.8 is filled on the top of water upto to a height of 0.5 m.
Calculate (i) total pressure on one side of tank
(ii) the position of centre of pressure for one side of the tank. Width of tank is 3m wide. (16) 1 AP

12. (a) In a two dimensional flow, the velocity potential function is given by $\phi = x(2y-1)$. Determine the velocity at point P(4,5). Determine the value of stream function at Point P. (16) 2 AP

(OR)

- (b) A venturimeter of inlet diameter 300mm and throat diameter 150mm is inserted in a horizontal pipe. A differential mercury manometer is connected to inlet pipe and throat gives a reading of 200mm. Find the discharge through the pipe if Coefficient of discharge is 0.98. (16) 2 AP

13. (a) The difference in water surface levels in two tanks, which are connected by three pipes in series of length 300 m, 170 m and 210 m and of diameters 300 mm, 200mm and 400 mm respectively is 12m. Determine the rate of flow if co efficient of frictions are 0.005, 0.0052 and 0.0048 respectively. Neglect minor losses. (16) 3 AP

(OR)

- (b) Derive Hagen Poiseuille Equation (16) 3 AP

14. (a) Analyze the following boundary layer parameters for the velocity distribution $u/U = 2(y/\delta) - (y/\delta)^2$ and determine
 i) Displacement thickness, ii) Momentum thickness,
 iii) Energy thickness (16) 4 U

(OR)

- (b) A thin plate is moving in still atmospheric air at a velocity 5 m/s. The length of plate is 0.6m and width 0.5m. Calculate the thickness of the boundary layer at the end of the plate and the drag force on one side of plate. Take density of air as 1.24 kg/m^3 and kinematic viscosity as 0.15 stokes. (16) 4 U

15. (a) The efficiency η of a fan depends on density ρ , dynamic viscosity μ , angular velocity ω , diameter D of the rotor and discharge Q. Express η in terms of dimensionless parameters using Rayleigh's method. (16) 5 U

(OR)

- (b) (i) Define the terms (8) 5 U
 (i) Reynold's number
 (ii) Froude Number
 (iii) Weber Number
 (iv) Euler Number
 (ii) Explain briefly about the different types of similarities. (8) 5 U