

II B. Tech I Semester Supplementary Examinations, October/November - 2018
FLUID MECHANICS
 (Civil Engineering)

Time: 3 hours

Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
 2. Answer **ALL** the question in **Part-A**
 3. Answer any **THREE** Questions from **Part-B**

~~~~~

**PART -A**

1. a) Derive the equation for capillary rise in a small tube dipped in a liquid. (4M)
- b) What is stream function? Write an equation for streamline in terms of stream function. (4M)
- c) Explain any one application of momentum equation. (3M)
- d) Define boundary layer with a neat sketch. (4M)
- e) Explain how Reynold's experiment is conducted. (4M)
- f) Briefly explain the working principle of Pitot static tube. (3M)

**PART -B**

2. a) What is Pascal's law? Explain with an example. (6M)
- b) A piston of 7.95 cm diameter and 30 cm long works in a cylinder of 8.0 cm diameter. The annular space of the piston is filled with an oil of viscosity 2 poise. If an axial load of 10N is applied to the piston, calculate the speed of movement of the piston. (10M)
3. a) Derive the equation for centre of force for a circular plane area immersed in a fluid. (8M)
- b) Determine whether the following velocity components satisfy the continuity equation. (8M)
  - i)  $u = cx$ ,  $v = -cy$
  - ii)  $u = -cx/y$ ,  $v = c \log xy$



4. a) Discuss the application of Bernoulli's equation for the following: (8M)  
(i) Inclined Manometer (ii) Orifice Meter
- b) Write the Navier-Stokes equation and explain the terms. (8M)
5. a) What is Magnus effect? Derive an expression for the stream function for flow past a cylinder with circulation. (8M)
- b) Derive an expression for the lift force for flow past a rotating cylinder. (8M)
6. a) What are hydraulic grade line and total energy line? How do you draw the same. (6M)
- b) A reservoir discharges water into the atmosphere through a compound horizontal pipe line ABC. The compound pipe consists of two pipes as noted below. A is junction point with the reservoir. AB: Diameter = 10cm , length = 25m,  $f = 0.02$ ; BC : Diameter = 12cm , length = 35m,  $f = 0.02$ ; The water level in the tank is (10M) above the centre line of the pipe. Calculate the discharge considering all the minor losses.
7. a) Explain the working of all the discharging measuring devices with required equations. (8M)
- b) Gasoline of specific of gravity 0.82 flows at a rate of 215 litres per second, upwards in an inclined venturimeter fitted to a 300mm diameter pipe. The venturimeter is inclined at 60 degrees to the vertical and its 150mm diameter throat is 1.2m from the entrance along its length. The pressure gauges inserted at entrance and throat show pressures of  $0.141 \text{ N/mm}^2$  and  $0.077 \text{ N/mm}^2$  respectively. Calculate the coefficient of discharge. (8M)

