PVP 14

Code: CE3T6

II B.Tech - I Semester–Regular/Supplementary Examinations
November 2019

FLUID MECHANICS
(CIVIL ENGINEERING)

Duration: 3 hours Max. Marks: 70

PART – A

Answer ***all*** the questions. All questions carry equal marks

11x 2 = 22 M

1.

a) How does the viscosity of liquids and gases vary with temperature?
b) Explain the concept of Pascal's law.
c) Give the equation for centre of pressure for vertical and inclined surfaces.
d) Differentiate between rotational and irrotational flows.
e) For the Euler's equation of motion, which forces are taken into consideration?
f) Write the assumptions made for derivation of Bernoulli's equation?
g) What is lift? What are the causes of lift?
h) Distinguish between laminar flow and turbulent flow in pipes.
i) Define major energy loss and minor energy losses in pipes.
j) Explain how flow rate is measured with a Pitot-tube.
k) Give the classification of orifices.

PART – B

Answer any ***THREE*** questions. All questions carry equal marks.

3 x 16 = 48 M

2. a) Explain Capillarity. Show that for a glass tube of small diameter 'd' opened at both ends, held partially immersed in a liquid of surface tension 'σ' and specific weight 'w', the capillary rise 'h' is given by the expression $h = \frac{4\,\sigma\cos\theta}{w \times d}$, in which θ is the angle of contact. 8 M

b) A gauge on the suction side of a pump shows a negative pressure of 0.285 bar. Express this pressure in terms of (i) N/m^2 absolute (ii) m of water gauge (iii) m of oil (sp. gr. 0.85) absolute and (iv) cm of mercury gauge. Take atmospheric pressure as 76 cm of mercury and specific gravity of mercury as 13.6. 8 M

3. a) Define path line, streak line, and stream line with neat sketches. For what type of flow path line, streak line, and stream lines are identical. 8 M

b) A triangular plate of base width 150 cm and height 2 m lies immersed in water with the apex downwards. The base of the plate is 1 m below and parallel to the free surface of water. Calculate the total pressure and position of centre of pressure. 8 M

4. a) State Bernoulli's equation and derive it for flow along a streamline. 8 M

b) Workout the following boundary layer parameters for the velocity profile prescribed by $u/U = (y/\delta)^{1/7}$ (i) Displacement thickness, (ii) momentum thickness, (iii) energy thickness. 8 M

5. a) Derive an expression for mean velocity for laminar flow between parallel plates at rest. 8 M

b) Two pipes each 300 m long are available for connecting to a reservoir from which a flow of 0.085 m^3/s is required. If the diameters of the two pipes are 0.30 m and 0.15 m respectively, determine the ratio of the head lost when the pipes are connected in series to the head lost when they are connected in parallel. Neglect minor losses. 8 M

6. a) Describe any one device that can use to measure the discharge through a pipe with the help of a neat sketch, and also obtain the expression of actual discharge. 8 M

b) An oil of sp. gr. 0.8 is flowing through a venturimeter having inlet diameter of 200 mm and throat diameter of 10 cm. The oil-mercury differential manometer shows a reading of 250 mm. Calculate the discharge of oil through the horizontal venturimeter. Take C_d = 0.98. 8 M