

Reg. No. :

--	--	--	--	--	--	--	--	--	--

Question Paper Code: 50135

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2017

Third Semester

Civil Engineering

15UCE305 - FLUID MECHANICS

(Regulation 2015)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

1. Viscosity has the dimensions
 - (a) $FL^{-2}T$
 - (b) $FL^{-1}T^{-1}$
 - (c) FLT^{-2}
 - (d) FL^2T
2. Continuity equation
 - (a) Expresses the relation between energy and work
 - (b) Relates the momentum per unit volume for two points on a streamline
 - (c) Relates the mass rate of flow along the Stream tube
 - (d) Constant discharge through a long, straight tapering edge
3. The boundary separation is caused by
 - (a) Release of bubbles from the fluid when the pressure goes below the vapour pressure
 - (b) An adverse pressure gradient
 - (c) Reduction of pressure gradient to zero
 - (d) The boundary layer thickness reducing to zero value
4. At a sudden expansion in a horizontal pipe
 - (a) Total energy line rises in the direction of flow
 - (b) Velocity head increasing in the direction of flow
 - (c) Hydraulic grade rises in the direction of flow
 - (d) Total energy line is below the hydraulic grade line

5. A 1:9 scale geometrically model of an open channel is buildup for a velocity of 3 m/sec in the model, the corresponding prototype velocity is
- (a) 1 (b) 3 (c) 9 (d) 27

PART - B (5 x 3 = 15 Marks)

6. Define surface tension and write the expression of surface tension of droplet.
7. Differentiate the velocity potential function and stream function.
8. Define energy thickness.
9. State total energy line.
10. Define Reynolds model law.

PART - C (5 x 16 = 80 Marks)

11. (a) Briefly explain the surface tension and calculate surface tension for soap bubble, water droplet and liquid jet. (16)

Or

- (b) A circular plate 2.5 m diameter is immersed in water, its greatest and least depth below the free surface being 3 m and 1 m respectively. Find the total pressure on one face of the plate and position of the center of pressure. (16)

12. (a) In a two dimensional incompressible flow, the fluid velocity components are given by $u = x-4y$ and $v = -y-4x$, Show that velocity potential exists and determine its form, Find also stream function. (16)

Or

- (b) A pipe line carrying oil of specific gravity 0.87 changes in diameter from 200 mm diameter at a position A to 500 mm diameter at a position B which is 5 m at a higher level. If the pressures at A and B are $9.81 \times 10^4 \text{ N/m}^2$ and $5.886 \times 10^4 \text{ N/m}^2$ respectively and the discharge is 200 l/s. Determine the loss of head and direction of flow. (16)

13. (a) For the laminar boundary layer, the velocity distribution is given by $u/U = 2(y/\delta) - (y/\delta)^2$. Compute the displacement thickness, energy and momentum thickness. (16)

Or

(b) What is separation of boundary layer? When it occur? Discuss the method of control the separation of boundary layer. (16)

14. (a) A pipe of diameter 20 cm and length 2000 m connects two reservoirs having difference of water level as 20 m. Determine the discharge through the pipe. If an additional pipe of diameter 20 cm and length 1200 m is attached to the last 1200 m length of the existing pipe, find the increase in the discharge. Take $f= 0.15$ and neglect minor losses. (16)

Or

(b) Derive Darcy – Weisbach frictional loss equation. (16)

15. (a) Explain Buckingham's π theorem and mansion the method of selecting the repeating variables. (16)

Or

(b) A 7.5 m height 16 m long spillway discharge $95 \text{ m}^3/\text{s}$ discharge under a head of 3 m, If a 1:9 scale model of this spillway is to be constructed, determine model dimensions, head over spillway model and the model discharge, If model experience a force of 7500 N determine force on the prototype. (16)
