

C

Reg. No. :

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

Question Paper Code : 53105

B.E./B.Tech. DEGREE EXAMINATION, NOV 2018

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. The ratio of actual velocity of fluid to theoretical velocity is called CO1- R
(a) Kinematic Velocity (b) Coefficient of Velocity
(c) Dynamic Velocity (d) Thermodynamic Velocity
2. A Grid obtained by drawing a series of equipotential lines and stream lines is called as CO2- R
(a) Stream tube (b) Equinet
(c) Flownet (d) Instantaneous Streamline
3. The component of total force in the direction perpendicular to the direction of flow is known as CO3- R
(a) Drag (b) Lift (c) Momentum (d) Transition
4. A compound pipe consisting of several pipes of varying diameter and length may be replaced by a pipe of uniform diameter is known as CO4- R
(a) Pipe in series (b) Pipe in parallel (c) Equivalent pipe (d) Bends

5. The complete similarity between model and the prototype is called CO5- R
 (a) Similitude (b) Similarity (c) Updation (d) Inertia

PART – B (5 x 3= 15Marks)

6. Define Surface tension and describe its phenomenon. CO1- R
7. Along a straight streamline passing through the origin, the velocity is given by $V = 8\sqrt{(x^2+y^2)}$, determine Velocity and Acceleration at point (8,6). CO2- App
8. What is Boundary layer? Give a sketch of a Boundary layer region over a flat plate. CO3 R
9. The diameter of a water pipe is suddenly enlarged from 350mm to 700mm. The rate of flow through it is $0.25\text{m}^3/\text{s}$. Calculate the loss of head in enlargement. CO4- App
10. Give the dimensions of following physical quantities CO5- R
 (1) Pressure
 (2) Surface Tension
 (3) Dynamic Viscosity

PART – C (5 x 16= 80Marks)

11. (a) (i) Determine the viscosity of oil having kinematic viscosity 6 strokes and specific gravity 2.0. CO1- App (8)
 (ii) Calculate the specific weight, mass density, specific volume and specific gravity of 2 litres of petrol weighs 13N. CO1- App (8)
- Or
- (b) (i) Derive the equation for the total pressure force acting on curved surface submerged in liquid. CO1- App (8)
 (ii) A rectangular plane surface is 2m wide and 3m deep. It lies in vertical plane in water. Determine the total pressure and position of centre of pressure in the plane surface when its upper edge is horizontal and coincides the water surface. CO1- App (8)
12. (a) Derive three dimensional continuity equation for steady incompressible flow. CO2- App (16)

Or

- (b) (i) Classify the various types of flow and brief about them. CO2- U (8)
(ii) Define the following CO2- U (8)
- (a) Pathline
(b) Streakline
(c) Streamline
(d) Instantaneous Streamline
13. (a) (i) Mention different methods to prevent boundary layer separation. CO3-U (8)
(ii) A smooth rectangular plate of 6m long x4m wide is kept immersed in water which moves with a velocity of 0.6m/s. Calculate the thickness of boundary layer at a distance of 2m from leading edge. Take Kinematic viscosity of water as $1.1 \times 10^{-6} \text{m}^2/\text{s}$. CO3-U (8)
- Or
- (b) (i) Describe briefly Turbulent boundary layer. CO3-U (8)
(ii) The velocity distribution in a boundary layer is given $(u/U)=(y/\delta)$ where u =Velocity at a distance y from the flat plate and $u=U$ at $y=\delta$, δ =Boundary layer thickness. Determine the value of CO3-App (8)
- (a) Displacement Thickness
(b) Momentum thickness
14. (a) (i) Mention the general characteristics of Laminar flow. CO4- U (8)
(ii) The rate of flow of water through a horizontal pipe is $0.3 \text{m}^3/\text{s}$. The diameter of the pipe suddenly enlarged from 25cm to 50cm. The pressure intensity in smaller pipe is $14 \text{N}/\text{m}^2$. Determine CO4-App (8)
- (a) Loss of head due to sudden enlargement
(b) Pressure intensity in large pipe
(c) Power lost due to enlargement
- Or
- (b) (i) What are the losses experience by a fluid when it is passing through a pipe. CO4- U (8)
(ii) A horizontal pipe of 400mm diameter is suddenly contracted to a diameter of 200mm. The pressure intensities in large and small pipe are given as $15 \text{N}/\text{cm}^2$ and $10 \text{N}/\text{cm}^2$. Find loss of head due to contraction if $C_c=0.62$. Determine also the rate of flow of water. CO4-App (8)

15. (a) (i) What are the uses of dimensional homogeneity? CO5-U (8)
- (ii) A model of a hydroelectric power station tail race is proposed to be built by selecting vertical scale 1 in 50 and horizontal scale 1 in 100. If the design pipe has flow rate of $600\text{m}^3/\text{s}$ and the allowable discharge of $800\text{m}^3/\text{s}$. Calculate the corresponding flow rate for model testing. CO5-App (8)

Or

- (b) (i) State limitations of Dimensional analysis. CO5-U (8)
- (ii) A 7.2m high and 15m long spillway discharges $94\text{m}^3/\text{s}$ under a head of 2m. If a 1:9 scale model of this spillway is to be constructed, determine the model law to be used, model dimensions head at spillway. CO5-App (8)