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Question Paper Code: 53015

B.E. / B.Tech. DEGREE EXAMINATION, NOV 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. A fluid which When passes through viscosity is known as
 - (a) Ideal fluid
 - (b) Real fluids
 - (c) Newtonian
 - (d) None of these
2. When a fluids does not change in both magnitude and direction from point to point is
 - (a) Uniform flow
 - (b) Non uniform flow
 - (c) Rotational flow
 - (d) Irrotational flow
3. A very thin layer of fluids called
 - (a) Energy thickness
 - (b) Boundary layer
 - (c) Displacement thickness
 - (d) Momentum thickness
4. If $Re < 2000$ is called a _____ flow.
 - (a) Turbulent flow
 - (b) Transition flow
 - (c) Lamina flow
 - (d) Dynamic flow
5. Write the dimension of power
 - (a) ML
 - (b) ML^2T^3
 - (c) MLD^2
 - (d) ML^2T^3

PART - B (5 x 3 = 15 Marks)

6. Define isothermal process.
7. What is meant by streak line?
8. Write the definition of boundary layer.
9. State major losses and give the Darcy formula.
10. Differentiate between undistorted and distorted models.

PART - C (5 x 16 = 80 Marks)

11. (a) (i) Classify the fluids and explain about the various types of fluids. (8)
(ii) Calculate the gauge and absolute pressure with A. a drop of water 0.4cm in diameter B. jet of water as 0.4cm in diameter take surface tension of water as 0.073N/m and atmospheric pressure has 101300N/m². (8)

Or

- (b) The dynamic viscosity of an oil used for lubrication between a shaft and sleeve is 6 poise. The shaft is 0.5m diameter and rotates at speed of 200rpm. Calculate power loss in the bearing for a sleeve length of 10mm thickness of oil film 1.5mm. (16)
12. (a) The velocity components in a two dimensional flow is given by $u = y^3/3 + 2x - x^2y$, $v = xy^2 - x^3/3$ show that given function represents two dimensional incompressible flow also obtain the expression for stream function (Ψ) and velocity potential (Φ). (16)

Or

- (b) Derive an expression for Euler's equation of motion. (16)
13. (a) Give the expression for displacement thickness and momentum thickness. (16)

Or

- (b) Find the displacement thickness, momentum thickness and energy thickness for the velocity distribution in the boundary layer is given by $u/U = 2(y/\Delta) - (y/\Delta)^2$. (16)
14. (a) A compound pipe in a system consists of 1800m of 50cm diameter, 1200m of 40cm diameter and 600m of 30cm diameter pipes of same material connected in series. What is equivalent length of 40cm pipe of same material? What is equivalent size of

pipe 3.6km long. If 3 pipes are parallel what is equivalent length of 50cm diameter pipe? (16)

Or

(b) A pipe line having diameter 30cm, length 3km carries water from P to R. The piezometric head of P and R are maintained that 100m and 80m. To increase a discharge of second pipe is added parallel to exist pipe P to R. The length of addition pipe is also 2km assume the friction factor $f=0.04$ for all pipe and ignore minor loss. What is increasing discharge of addition pipes as same diameter of 0.3m? (16)

15. (a) The discharge Q of a centrifugal pump depends upon the mass density of fluid (δ) the speed of the pump (N), the diameter of the impeller (D), the manometric head (H_m) and the viscosity of fluid (μ). Show that $Q = ND^3 \Phi \left[\frac{gH}{N^2 D^2}, \frac{\mu}{\delta N D^2} \right]$ (16)

Or

(b) (i) Discuss on dimensionless number and their significance. (8)

(ii) A 7.2m height and 15m long spillway discharges $94 \text{ m}^3/\text{s}$ discharge under head of 2.03. If 1:9 scale model of this spillway is to be constructed, determine model dimensions, head over spillway model and model discharge. (8)
