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Question Paper Code: 53A04

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

Third Semester

Agricultural Engineering

15UAG304 - FLUID MECHANICS AND HYDRAULICS

(Regulation 2015)

Duration: Three hours

Maximum: 100 Marks

PART A - (10 x 1 = 10 Marks)

1. Fluid in a substance which offers no resistance to change of _____
(a) Pressure (b) Shape (c) Volume (d) Temperature
CO1- R
2. Pressure measured above complete vacuum is _____ pressure
(a) gage (b) absolute (c) vacuum (d) atmospheric
CO1 -R
3. The liquid in a rotating tank illustrate ____ flow
(a) rotational (b) irrotational (c) laminar (d) turbulent
CO2 -R
4. Bernoulli's equation deals with the law of conservation of _____
(a) Mass (b) Energy (c) Momentum (d) Work
CO2- R
5. Pitot tube is used to measure _____
(a) velocity (b) discharge (c) flow (d) pressure
CO3- R
6. The ratio of inertia force to viscous force is known as _____ number
(a) Reynolds (b) Froude (c) Mach (d) Euler
CO3- R

7. Trapezoidal channel section will be most economical when hydraulic radius is equal to CO4- R
- (a) depth of flow (b) $\frac{3}{4}$ the depth of flow
- (c) half the depth of flow (d) $\frac{1}{4}$ the depth of flow
8. _____ is a concrete structure used to measure flow in open channel CO4- R
- (a) Notch (b) Weir (c) Syphon (d) Venturi meter
9. Cavitation will take place if the pressure of the flowing fluid at any point is _____ vapour pressure of the fluid CO5- R
- (a) more than (b) less than
- (c) equal to (d) less than nor equal to
10. Multistage centrifugal pumps are used to obtain CO5- R
- (a) High head (b) High discharge
- (c) Pumping of high viscous fluid (d) High efficiency

PART – B (5 x 2= 10Marks)

11. State Pascal's law. Give at least two examples where this principle is applied. CO1- R
12. Classify fluid flow CO2 -R
13. Differentiate Orifice and mouthpiece CO3 -R
14. Find the discharge of water flowing over a rectangular notch of 2m length when the constant head over the notch is 300 mm. Take $C_d = 0.60$. CO4- R
15. State the difference between a closed, semi-closed and open impeller with sketch. CO5 -R

PART – C (5 x 16= 80Marks)

16. (a) An isosceles triangular plate of base 4 m and altitude 6 m is immersed vertically in water. Its axis of symmetry is parallel to and at a depth of 6 m from the free water surface. Calculate the magnitude and location of total pressure force. CO1 -App (16)
- Or
- (b) Derive an expression to determine pressure using U-tube and inverted U – tube differential manometer add necessary diagram CO1 -App (16)
17. (a) Derive continuity equation in Cartesian co-ordinates CO2 -App (16)
- Or
- (b) Describe flow pattern with necessary sketch CO2 -Ana (16)
18. (a) A venture meter with 200 mm diameter at inlet and 100 mm throat is laid with axis horizontal, and is used for measuring the flow of oil of specific gravity 0.8. The difference of levels in the U-tube differential manometer reads 180 mm of mercury whilst 11.52×10^3 kg of oil is collected in 4 minutes. Calculate the co-efficient of discharge for the meter. Take specific gravity of mercury as 13.6. CO3 -Ana (16)
- Or
- (b) Derive an equation for head loss in pipes using Darcy-Weisbach equation CO3- Ana (16)
19. (a) (i) State the conditions under which the rectangular section of an open channel will be most economical. Derive these conditions. CO4 -U (8)
- (ii) Derive an equation for minimum specific energy in terms of critical depth (8)
- Or
- (b) Water flows at a steady and uniform depth of 2 m in an open channel of rectangular cross section having base width equal to 5 m and laid at a slope of 1 in 1000. It is desired to obtain critical flow in the channel by providing a hump in the bed. Calculate height of hump and sketch the flow profile. Consider the value of Manning's rugosity co-efficient $N = 0.02$ for the channel surface. CO4 -Ana (16)

20. (a) What are the dimensionless numbers in fluid mechanics? Define them. Under what circumstances in each of these important. CO5- U (16)

Or

(b) Describe the working of air lift pump and hydraulic ram CO5- U (16)