Reg. No. :

Question Paper Code:R3A05

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2024

Third Semester

Agricultural Engineering

R21UAG305– FLUID MECHANICS AND OPEN CHANNEL HYDRAUILCS

(Regulations R2021)

Duration: Three hours   Maximum: 100 Marks

Answer All Questions

PART A - (10 x 1 = 10 Marks)

1. If the diameter of a capillary tube is doubled, the capillary rise will become   CO1 -U

    (a)4 times   (b) Double   (c) Half   (d) Same

2. When a dolphin glides through air, it experiences an external pressure of 0.75 m of mercury. The absolute pressure on dolphin when it is 5m below the free surface of the water is   CO2-App

    (a) 0.10N/mm2   (b) 0.5N/mm2   (c) 1.0N/mm2   (d) 0.15N/mm2

3. The imaginary line drawn in the fluid in such a way that the tangent to any point gives the direction of motion at that point is known as   CO1 -U

    (a)path line   (b) stream line   (c) steak line   (d) potential line

4. The flow net is used to determine the   CO1 -U

    (a) stream lines   (b) Equipotential lines   (c) path line   (d) both a and b

5. Which of the flowing is a major loss   CO1 -U

    (a) Friction loss   (b) shock loss   (c) entry loss   (d) exit loss

6. The range of Coefficient of discharge of venturimeter is   CO1 -U

    (a) 0.6 to 0.7   (b)0.7 to 0.8   (c) 0.8 to 0.9   (d) 0.95 to 0.99

7. The device used for measuring discharge of irrigation channel ,well or canal outlet is called   CO1 -U

    (a) weir   (b) notch   (c) meter gate   (d) all are correct

8. A rectangular channel 2 m deep and 6 m wide has a velocity of flow of water as 2.58 m/s. Determine the discharge of water through the channel   CO2-App

   (a) 34.4 m3/sec   (b) 14.2 m3/sec   (c) 14.0 m3/sec   (d) 30.9 m3/sec

9. A Single acting reciprocating pump has the plunger diameter of 20cm and stroke of 30cm.the pump discharge 0.53m3 of water per minutes at 60rpm.find the theoretical discharge   CO2-App

   (a) 0.00742m3/sec   (b) 0.00142m3/sec   (c) 0.00842m3/sec   (d) 0.00942m3/sec

10. To Produce a high head multi-stage centrifugal pump,the impellers are connected   CO1 -U

    (a) Reciprocating Pump   (b) Centrifugal pump   (c) Propeller pump   (d) Jet pump

PART – B (5 x 2= 10Marks)

11. Determine the viscosity of a liquid having kinematic viscosity 6 stokes and specific gravity 1.9.   CO2 App

12. Distinguish between stream line and streak line.   CO1 U

13. Write the ranges for friction with Reynolds number.   CO1 U

14. In a rectangular open channel ,2m wide water flows at a depth of 0.8m.it discharge over an aerated sharp crested weir over the full width ,the depth over weir crest being 0.25m.cc=0.61.adjusting for velocity head of approach ,what would be the discharge through the channel?√2g=4.43 units.   CO2 App

15. What are the methods of dimensional analysis?   CO1 U

PART – C (5 x 16= 80Marks)

16. (a) Calculate the dynamic viscosity of an oil, which is used for lubrication between a square plate of size 0.8 m x 0.8 m and an inclined plane with angle of inclination 30o as shown in Fig. 1.4. The weight of the square plate is 300 N and it slides down the inclined plane with a uniform velocity of 0.3 m/s. The thickness of oil film is 1.5 mm.   CO2 App   (16)

Or

   (b) If the velocity profile of a fluid over a plate is parabolic with the vertex 20cm from the plate, where the velocity is 120cm/sec. Calculate the velocity gradients and shear stress at a distance of 0,10 and 20cm from the plate, if the viscosity of the fluid is 8.5 poise.   CO2 App   (16)

17. (a) Derive the Euler's equation of motion and deduce that to Bernoulli's equation. CO2 App (16)

Or

(b) A pipe line carrying oil of specific gravity 0.87changes in diameter from 200 mm dia at a position Ato 500 mm dia at a position B which is 4m at a higherlevel. If the pressure at A and B are $9.81N/cm^2$ and 5.886N/cm2 respectively and the discharge is 200 lit/s. Determine the loss of head and direction of flow. CO2 App (16)

18. (a) The rate of flow of water through a horizontal pipe is $0.3m^3/s$.the diameter of the pipe which is 200mm is suddenly enlarged to 400mm.the pressure intensity in the smaller pipe is $12.772N/cm^2$.determine i)loss of head due to sudden enlargement ii) pressure intensity in the large pipe   iii)power loss due to enlargement CO2 App (16)

Or

(b) A horizontal Venturimeter with inlet diameter 30cmand throat dia 15cm is used to measure the flow of oilof sp.gr 0.8.The discharge of oil through Venturimeter is 50 lit/sec.Find the reading of the oil-mercurydifferential manometer.cd=0.98 CO2 App (16)

19. (a) Derive the condition for the most economical rectangular channel CO2 App (16)

Or

(b) A Cipolletti weir of crest length 60cm discharges water the head of water over the weir is 360mm.Find the discharge over the weir if the channel is 80cm wide and 50cm deep. Take cd=0.60 CO2 App (16)

20. (a) Using Buckingham's π theorem, show that the velocity through a circular orifice is given by $v=\sqrt{2gH}\emptyset\,[\frac{D}{H},\frac{\mu}{\rho VH}]$ where H is the head causing flow,D is the diameter of the orifice is co-efficient of viscosity is the mass density and g is the acceleration due to gravity. CO2 App (16)

Or

(b) The efficiency η of a fan depends on the density ρ,the dynamic viscosity μ of the fluid,the angular velocity ω,diameter D of the rotor and the discharge Q.express η in terms of dimensionless parameters. Using Rayleigh's method CO2 App (16)

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