A

Question Paper Code: 93105

B.E. / B.Tech DEGREE EXAMINATION, NOV 2022

Third Semester

Civil Engineering

19UCE305 FLUID MECHANICS

(Regulation 2019)

Duration: Three hours   Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

1. Atmospheric pressure held in terms of water column is   CO1- U

    (a) 7.5 m   (b) 8.5 m   (c) 9.81 m   (d) 10.3 m

2. Bernoulli's theorem deals with the law of conservation of   CO1- U

    (a) Mass   (b) Momentum   (c) Energy   (d) None of the above

3. The unit of physical quantity which does not depend on the unit of any other   CO3- U
   physical quantity is called as

     (a) independent dimension   (b) fundamental dimension

     (c) core dimension   (d) none of the above

4. A liquid flows through pipes 1 and 2 with the same flow velocity. If the   CO2- Ana
   ratio of their pipe diameters d1 : d2 be 3:2, what will be the ratio of the head
   loss in the two pipes?

    (a) 3:2   (b) 9:4   (c) 2:3   (d) 4:9

5. The boundary layer separation takes place if   CO1- U

     (a) Pressure gradient is zero   (b) Pressure gradient is positive

     (c) Pressure gradient is negative   (d) None of the above

PART – B (5 x 3= 15 Marks)

6. What is a fluid? How are fluids classified?   CO1- U

7. Define stream line.   CO1- U

8. List the types of similarities between model and prototype..   CO1- U

9. Define critical velocity   CO1- U

10. Illustrate the examples of formation of boundary layer in day to day life   CO2- App

<div align="center">PART – C (5 x 16= 80 Marks)</div>

11. (a) A 400 mm diameter shaft is rotating at 200r.p.m. in a bearing of   CO2- App   (16)
length 120mm. If the thickness of oil film is 1.5 mm and the dynamic viscosity of the oil is 0.7 Ns/m². Determine the torque required to overcome friction in bearing and power utilized in overcoming viscous resistance. Assume a linear velocity profile.

<div align="center">Or</div>

(b) A trapezoidal channel 2m wide at the bottom and 1m deep has   CO2- App   (16)
side slope 1:1 determine the Total pressure and Centre of pressure on the vertical gate closing the channel when its full of water

12. (a) Briefly describe about velocity potential function and stream   CO1- U   (16)
function and its relations.

<div align="center">Or</div>

(b) A 30cm diameter pipe conveying water branches into two pipes   CO2- App   (16)
of diameters 20cm and 15 cm respectively. if the average velocity in the 30cm diameter pipe is 2.5m/s.Find the discharge in the pipe, also determine the velocity in 15cm pipe .if the average velocity in 20cm diameter pipe is 2m/s

13. (a) The efficiency η of a fan depends on the density ρ, the dynamic   CO2- App   (16)
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. Use (Rayleigh's Method) .

<div align="center">Or</div>

(b) Discuss about Buckingham's π theorem. State the procedure for   CO2- App   (16)
solving problems.

14. (a) A sudden enlargement of a water main from 240mm to 480mm   CO2- App   (16)
diameter ,The hydraulic gradient by 10mm.Estimate the rate of flow.

<div align="center">Or</div>

(b) An oil specific gravity of 0.9 and viscosity 0.06poise is flowing   CO2- App   (16)
through a pipe of diameter 200mm at the rate of 60litres/s.Find the head lost due to friction for a 500m length of pipe. Find the power required to maintain this flow.

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15. (a) A flat plate 1.5m X 1.5m moves at 50km/hr in stationary air of density 1.15kg/m^3 .If the coefficient of drag and life are 0.15 and 0.75 respectively. Determine the lift force, drag force ,resultant force and the power required to keep the plate in motion   CO3- Ana   (16)

Or

(b) Determine the thickness of the boundary layer at the tailing edge of smooth plate of length 4 m and of width 1.5 m ,when the plate is moving with a velocity of 4 m/s in stationary air. Take kinematic viscosity =1.5 X 10^{-5} m^2/s   CO2- App   (16)

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