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Question Paper Code: 53A04

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

Third Semester

Agricultural Engineering

15UAG304 - FLUID MECHANICS AND HYDRAULICS

(Regulation 2015)

Duration: Three hours   Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. The force per unit length is the unit of   CO1-R

    (a) Surface tension   (b) Compressibility   (c) Capillarity   (d) Viscosity

2. A manometer is used to measure   CO1-R

    (a) Low pressure.   (b) Moderate pressure.

    (c) High pressure.   (d) Atmospheric pressure.

3. A flow in which the quantity of liquid flowing per second is not   CO2-R
    constant, is called

    (a) Streamline flow.   (b) Turbulent flow.   (c) Steady flow.   (d) Unsteady flow.

4. The imaginary line drawn in the fluid in such a way that the tangent   CO2-R
    to any point gives the direction of motion at that point, is known as

    (a) Path line   (b) Stream line   (c) Steak line   (d) Potential line

5. The pressure of the liquid flowing through the divergent portion of a   CO3- R
    venturimeter

    (a) Remains constant   (b) Increase

    (c) Decrease   (d) Depends upon mass of liquid

6. Bernoulli's equation is applied to   CO3- R

    (a) Venturimeter   (b) Orifice meter   (c) Pitot tube   (d) All of these

7. The discharge over a rectangular notch is   CO4- R

   (a) Inversely proportional to $H^{3/2}$ (b) Directly proportional to $H^{3/2}$

   (c) Inversely proportional to $H^{5/2}$ (d) Directly proportional to $H^{5/2}$

8. A structure used to dam up a stream or river over which the water   CO4-R
   flows is called

   (a) Orifice   (b) Notch   (c) Weir   (d) Dam

9. Pump is a device which convert   CO5- R

   (a) Hydraulic energy into electrical energy.

   (b) Hydraulic energy into Mechanical energy

   (c) Mechanical energy into hydraulic energy.

   (d) Mechanical energy into electrical energy.

10. Model analysis of pipes flow are based on   CO5- R

    (a) Reynold number   (b) Froude number   (c) Mach number   (d) Euler number

PART – B (5 x 2= 10 Marks)

11. Define Capillarity.   CO1- R

12. Differentiate steady and unsteady flow.   CO2- R

13. List the assumptions used in deriving Bernoulli's equation.   CO3- R

14. What is notch?   CO4- R

15. Write the uses of dimension analysis.   CO5- R

PART – C (5 x 16= 80 Marks)

16. (a) Calculate the capillary rise in a glass tube of 2.5 mm diameter   CO1- App   (16)
         when immersed vertically in
         (i) water and
         (ii) mercury. Take surface tension is 0.0725 N/m for water and
         0.52 N/m for mercury in contact with air. The specific gravity for
         mercury is given as 13.6 and angle of contact is 130^{0}.

Or

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(b) An oil of viscosity 5 poise is used for lubrication between a shaft and sleeve. The diameter of the shaft is 0.5 m and it rotates at 200 r.p.m. Calculate the power lost in oil for a sleeve length of 100 mm. The thickness of oil film is 1.0 mm.   CO1- App   (16)

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

<center>Or</center>

(b) Water flows through a pipe AB 1.2 m diameter at 3 m/s and then passes through a pipe BC 1.5 m diameter. At C, the pipe branches. Branch CD is 0.8 m in diameter and carries one-third of the flow in AB. The flow velocity in branch CE is 2.5 m/s. Find the volume rate of flow in AB, the velocity in BC, the velocity in CD and the diameter of CE.   CO2- Ana   (16)

18. (a) The water is flowing through a pipe having diameters 20 cm and 10 cm at sections 1 and 2 respectively. The rate of flow through pipe is 35 litres/s. The section 1 is 6 m above datum and section 2 is 4 m above datum. If the pressure at section 1 is 39.24 N/cm^2, find the intensity of pressure at section 2.   CO3- Ana   (16)

<center>Or</center>

(b) An oil of sp. Gr. 0.8 is flowing through a venturimeter having inlet diameter 20 cm and throat diameter 10 cm. The oil-mercury differential manometer shows a reading of 25 cm. Calculate the discharge of oil through the horizontal venturimeter. Take C_d=0.98.   CO3- Ana   (16)

19. (a) Determine the height of a rectangular weir of length 6 m to be built across a rectangular channel. The maximum depth of water on the upstream side of the weir is 1.8 m and discharge is 2000 litters/s.Take C_d = 0.6 and neglect end contractions.   CO4-U   (16)

<center>Or</center>

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(b) A right-angled V- notch is used for measuring a discharge of 30   CO4- Ana   (16)
    litters/s. An error of 1.5 mm was made while measuring the head
    over the notch. Calculate the percentage error in the discharge.
    Take $C_d = 0.62$.

20. (a) The efficiency η of a fan depends on the density ρ, the dynamic   CO5- U   (16)
        viscosity μ of the fluid, the angular velocity ω, diameter D of the
        rotor and discharge Q. Express η in terms of dimensionless
        parameters.

                                        Or

    (b) A centrifugal pump is to discharge 0.118 m^3/s at a speed of 1450   CO5-U   (16)
        r.p.m. against a head of 25 m. The impeller diameter is 250 mm,
        its width at outlet is 50 mm and manometric efficiency is 75 %.
        Determine the vane angle at the outer periphery of the impeller.

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