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Reg. No. :

Question Paper Code: 53A04

B.E. / B.Tech. DEGREE EXAMINATION, DEC 2021

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 ratio of weight of fluid to unit volume of fluid is called   CO1-R

    (a) Density   (b)Specific weight   (c)Mass density   (d)Viscosity

2. A manometer is used to measure   CO1-R

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

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

3. It is a type of flow in which the fluid particles while flowing along   CO2-R
    stream lines, also rotate about their own axis.

    (a) Rotational flow   (b) Laminar flow   (c) Irrotational flow   (d)Vortex 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. Which of the following is or are the hydraulic coefficients?   CO3- R

    (a) Coefficient of velocity   (b) Coefficeint of Contraction

    (c) Coefficient of discharge   (d) All of the above

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. The sheet of water flowing through a notch or over a weir is called   CO4-R

    (a) Crest   (b) Sill   (c) Nappe   (d) Nacelle

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. Which of the following is / are the components of centrifugal pump   CO5- R

    (a) Impeller   (b) Casing   (c) Suction pipe   (d)All of above

PART – B (5 x 2= 10 Marks)

11. Define capillarity   CO1- R

12. Write continuity equation based on principle of conservation of mass   CO2- R

13. State the applications of Bernoulli's equation   CO3- R

14. Classify notches   CO4- R

15. Define Reynolds number   CO5- R

PART – C (5 x 16= 80 Marks)

16. (a) A U tube manometer is used to measure the pressure of water in a   CO1- App   (16)
         pipe line, which is in excess of atmospheric pressure. The right
         limb of the manometer contains mercury and is open to
         atmosphere. The contact between water and mercury is in the left
         limb. Determine the pressure of water in the main line, if the
         difference in level of mercury in the limbs of U-tube is 10 cm and
         the free surface of mercury is in level with the centre of the pipe.
         If the pressure of water in pipe line is reduced to 9810 N/m^2,
         calculate the new difference in the level of mercury. Sketch the
         arrangements in both cases.

Or

53A04

(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) Derive acceleration of a Fluid Particle in Cartesian coordinates   CO2- App   (16)

Or

(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) Discuss in detail water hammer in pipes with neat sketch.   CO3- Ana   (16)

Or

(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)

Or

(b) Explain how current meter and float is used for measuring the flow in a   channel   CO4- Ana   (16)

20. (a) Discuss in detail sludge pump and vacuum pump   CO5- U   (16)

Or

(b) A centrifugal pump is to discharge 0.118 m^3/s at a speed of 1450 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.   CO5-U   (16)

53A04