A **Reg. No. :** | | | | | | | | | | | | |

Question Paper Code: U3A05

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

Third Semester

Agriculture Engineering

21UAG305– FLUID MECHANICS AND OPEN CHANNEL HYDRAUILCS

(Regulations 2021)

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- U

   (a) density (b) specific weight (c) mass density (d) viscosity

2. 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

3. According to equation of continuity _____. CO2- U

   (a)w 1 a 1 = w 2 a (b) w 1 v 1 = w 2 v 2 (c)a 1 v 1 =a 2 v 2 (d) a 1/ v 1 =a 2/ v 2

4. 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

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 discharge in an open channel corresponding to critical depth is CO1- U

   (a) zero (b) minimum (c) maximum (d) none of these

8. The most efficient rectangular section is the one which has CO1- U

   (a) b = d (b) d = 2b (c) b = 2d (d) b = d/3

9. The manometric efficiency of a centrifugal pump is given by CO1- U

   (a) infiltration (b) percolation (c) runoff (d) seepage

10 Which of the following is the positive displacement pump? CO1- U

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

PART – B (5 x 2= 10 Marks)

11 Find the surface tension in a soap bubble of 40 mm diameter when the inside pressure is 2.5 N/m2 above atmospheric pressure. CO2- App

12 Write Euler"sequation. CO1- U

13 What is venturimeter? Write the main parts of Venturimeter. CO1- U

14 Difference between Normal Depth and Critical Depth CO1- U

15 State Buckingham's πtheorem. CO2- App

PART – C (5 x 16= 80 Marks)

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) Calculate the capillary rise in a glass tube of 2.5 mm diameter when immersed vertically in (a) water and (b) mercury. Take surface tensions σ = 0.0725 N/m for water and σ = 0.52 N/m for mercury in contact with air. The specific gravity for mercury is given as 13.6 and angle of contact = 130^o CO2- App (16)

17 (a) The water is flowing through a pipe having diameter 20cm and 10cm at section 1 and 2 respectively. The rate of flow through pipe is 35 liters/sec. The section 1 is 6 m above datum and section 2 is 4m above the datum. If the pressure at section 1 is 39.24N/cm2.Find the intensity of pressure at section 2. CO2- App (16)

Or

(b) Water flow through a pipe AB 1.2 m diameter at 3 m/s and the passes through a pipe BC 1.5 cm diameter. At C, the pipe branches. Branch CD is0.8 m in diameter and carries one third of flow in AB. The 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- App (16)

18	(a)	An oil of sp.gravity 0.9 is flowing through a venturimeter having inlet diameter 20cm and throat diameter 10cm.The oil mercury differential manometer shows a reading of 20cm.Calculate the discharge of oil through the horizontal venturimeter take cd=0.98	CO2- App	(16)
		Or		
	(b)	An orifice meter with orifice diameter 10cm is inserted in a pipe of 20cm diameter. The pressure gauges fitted upstream and downstream of the orifice meter gives reading of 19.62N/cm2 and 9.81 N/cm2 respectively.co-efficient of discharge for the orifice meter is given as 0.6.find the discharge of water through pipe	CO2- App	(16)
19.	(a)	A rectangular channel 4m wide has depth of water 1.5m.the slope of the bed of the channel is 1 in 1000 and value of chezy's constant c=55.it is desired to increase the discharge to a maximum by changing the dimensions of the section for constant area of cross section slope of the bed and roughness of the channel. find the new dimensions of the channel and increase in discharge.	CO2- App	(16)
		Or		
	(b)	Derive the condition for the most economical rectangular channel.	CO2- App	(16)
20.	(a)	Draw a neat sketch of centrifugal pump and explain the working principle of centrifugal pump.	CO2- App	(16)
		Or		
	(b)	The internal and external diameters of the impeller of a centrifugal pump are 200 mm and 400mm respectively. the pump is running at 1200 r.p.m. The vane angles of the impeller at inlet and outlet are 20° and 30° respectively. The water enters the impeller radially and velocity of flow is constant.dtermine the work done by the impeller per unit weight of water.	CO2-App	(16)