

THE KAVERY ENGINEERING COLLEGE
(An Autonomous Institution)

B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, NOV /DEC 2024

Third Semester

Agricultural Engineering

AI3303 - FLUID MECHANICS AND PUMPS

Regulations - 2021

Duration : 3 Hrs

*Maximum : 100
Marks*

PART - A (ANSWER ALL QUESTIONS) (Marks 10*2=20)

Q.No	Questions	BLT	CO	Marks
1.	Compare specific weight and specific volume.	UN	1	2
2.	Write down the expression for capillary fall in terms of surface tension.	RE	1	2
3.	Classify the types of Motion.	RE	2	2
4.	Distinguish between stream line and streak line.	UN	2	2
5.	Write short note on distorted model and undistorted model.	RE	3	2
6.	Distinguish between Geometric similarity and Kinematic similarity.	UN	3	2
7.	State the flow conditions for the occurrence of hydraulic jump.	RE	4	2
8.	Define and distinguish between steady flow and unsteady flow.	UN	4	2
9.	What is net positive suction head in a centrifugal pump?	RE	5	2
10.	Mention the main components of reciprocating pump.	RE	5	2

PART - B (ANSWER ALL QUESTIONS) (Marks 5*13 = 65)

Q.No	Questions	BLT	CO	Marks
11.	a 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	UN	1	13
	Or			
	b i A block of wood of specific gravity 0.7 floats in water. Determine the meta-centric height of the block if its size is 2 m * 1 m * 0.8 m.	UN	1	07
	ii Calculate the specific weight, density and specific gravity of one litre of a liquid, which weighs 7N.	UN	1	06
12.	a i A stream function is given by $\Psi = 3x^2 - y^3$. Determine the magnitude of velocity components at the point (2, 1).	AN	2	07
	ii How are fluids classified? Explain with examples	Un	2	06
	Or			
	b A ripple 200 m long slop down at 1 in 100 and taper from 600 mm diameter at the higher end to 300 mm diameter at the lower end, and carries 100 litres/ sec of oil having specified gravity 0.8. If the pressure gauge at the higher end reads 60 kN/m ² , determine the velocities at the two ends and also the pressure at the lower end.	AN	2	13

13.	a	Water ($\gamma_w = 9.879 \text{ kN/m}^3$) flows with flow rate of $0.3 \text{ m}^3/\text{sec}$ through a pipe AB of 10 m length and of uniform cross section. The end B is above end A and the pipe makes an angle of 30° to the horizontal. For a pressure of 12 kN/m^2 at the end B, Find the corresponding pressure at the end A.	AN	3	13
		Or			
	b	A venturimeter has its axis vertical, the inlet and throat diameters being 150mm and 75mm respectively. The throat is 225 mm above inlet and $K = 0.96$. Petrol of specific gravity 0.78 flows up through the meter at a rate of $0.029 \text{ m}^3/\text{s}$. Find the pressure difference between the inlet and the throat	AN	3	13
14.	a	The discharge of water through a rectangular channel of width 8 m, is $15 \text{ m}^3/\text{s}$ when depth of flow of water is 1.2 m. Calculate :i) Specific energy of the flowing water. ii) Critical depth and critical velocity iii) Value of minimum specific energy.	AN	4	13
		Or			
	b	A 3m wide rectangular channel carries a flow of $6 \text{ m}^3/\text{sec}$. The depth of flow at a section P is 0.5m. A flat-topped hump is to be placed at the downstream of the section P. Assume negligible energy loss between section P and hump, and consider g as 9.81 m/s^2 . Find the maximum height of the hump (expressed in m) which will not change the depth of flow at section P.	AN	4	13
15.	a	The internal and external diameters of the impeller of a centrifugal pump are 200 mm and 400 mm 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. Determine the work done by the impeller per unit weight of water.	AN	5	13
		Or			
	b	A centrifugal pump rotating at 1000 r.p.m delivers 160 litres/s water against a head of 30 m. The pump is installed at a place where atmospheric pressure is $1 \times 10^5 \text{ Pa(abs.)}$, and vapour pressure of water is 3 kPa(abs.) . The head loss in suction pipe is equivalent to 0.2 m of water, Calculate i) Minimum NPSH and ii) Maximum allowable height of the pump from free surface of water in the sump.	AN	5	13

PART – C (Marks 1*15 = 15)

Q.No		Questions	BLT	CO	Marks
16.	a i	Describe the working of a reciprocating pump with neat sketch.	UN	1	10
	ii	Explain the characteristics of Newtonian and non- Newtonian fluids in detail	UN	1	05
		Or			
	b	The inlet and throat diameter of a horizontal venturimeter are 30cm and 10 cm respectively. The Liquid flowing through the meter is water. The pressure intensity at inlet is 13.734 N/cm^2 . While the vacuum pressure head at the throat is 37cm of mercury. Find the rate of flow. Assume that 4% of the differential head is lost between the inlet and throat. Find also the value of C_d for the venture meter.	AN	3	15