Register No : _____

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, APRIL-MAY 2025

Third Semester

Agricultural Engineering

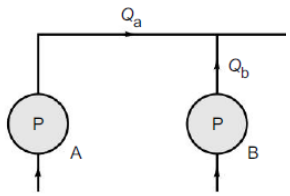
AI3303 – Fluid Mechanics and Pumps

Regulations - 2021

Duration : 3 Hrs ***Maximum : 100 Marks***

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

Q.No	*Questions*	*BLT*	*CO*	*Marks*
1.	State Newton's Law of viscosity.	L1	1	2
2.	Three liters of petrol weighs 23.7 N. Determine the mass of density of fluid in Kg/m^3.	L2	1	2
3.	List any two types of fluid flow.	L1	2	2
4.	Define the terms path line and stream line.	L1	2	2
5.	What is the major loss in pipe? How it differs from minor losses?	L2	3	2
6.	Determine the dimensions of the following quantities in MLT θ system 1. Mass density, 2. Velocity	L2	3	2
7.	State the Manning's formula which is used to determine the average velocity of flow in open channel.	L1	4	2
8.	Define the following terms 1. Coefficient of Discharge 2. Coefficient of contraction.	L1	4	2
9.	Sketch the schematic diagram of centrifugal compressor and mentions its parts.	L1	5	2
10.	If two pumps are connected parallelly as shown below. Determine the total discharge and total head.	L2	5	2

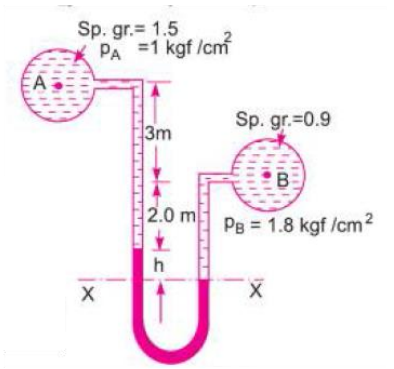


PART – B (ANSWER ALL QUESTIONS) (Marks 5*16 = 80)

Q.No		*Questions*	*BLT*	*CO*	*Marks*
11.	a	A 15cm diameter vertical cylinder rotates concentrically inside another cylinder of diameter 15.10 cm. Both cylinders are 25cm high. The space between the cylinders is filled with a liquid whose viscosity is unknown. If a torque of 12.0 Nm is required to rotate the inner cylinder at 100 rpm. Determine the viscosity of fluid.	L3	1	16

Or

	b	A differential manometer is connected at the two points A and B of two pipes as shown in Figure. The pipe A contains a liquid of specific gravity 1.5 while pipe B contains a liquid of specific gravity 0.9. the pressures at A and B are 1 kgf/cm^2 and 1.8 kgf/cm^2 respectively. Find the difference in mercury level in the differential manometer.	L3	1	16



12.	a	State Bernoulli's Theorem for steady flow of an incompressible fluid. Derive an expression for Bernoulli's theorem also state the assumptions made for this derivation.	L2	2	16
		Or			
	b	Describe about the concept and principle of venturimeter with neat sketch. Derive the expression for the rate of flow of fluid through it.	L2	2	16
13.	a	The rate of flow of water through a horizontal pipe is 0.25 m^3/s. The diameter of the pipe which is 200 mm is suddenly enlarged to 400 mm. the pressure intensity in the smaller pipe is 11.772 N/cm^2. Determine (1) Loss of head due to sudden enlargement (2) Pressure intensity in the large pipe (3) power lost due to enlargement.	L4	3	16
		Or			
	b i	Describe the steps need to follow for solving problems by Buckingham's π – Theorem.	L2	3	6
	ii	The efficiency (η) of a fan depends on density (ρ), dynamic viscosity (μ), angular velocity (ω), diameter of the rotor (D) and the discharge (Q). Express efficiency (η) in terms of dimensionless parameters	L4	3	10
14.	a i	A triangular channel has a side slope of 1.5 horizontal: 1 vertical and is laid on a longitudinal slope of 1 in 1650. Assuming n = 0.013. Estimate the normal depth required to pass a discharge of 0.3 m^3/s.	L4	4	6
	ii	A trapezoidal channel is to be designed to convey 50 m^3/s of water at a velocity of 2 m/s. the bed width to depth ratio is to be 8 and the side slopes are to be 1 horizontal: 1 vertical. It will be lined with a material whose n = 0.02. calculate the bed width, depth of flow and slope of the channel.	L4	4	10

Or

	b	i	The head of water over a rectangular weir is 40 cm. The length of the crest of the weir with end contraction suppressed is 1.5 m. Find the discharge using (1) Francis's Formula (2) Bazin's formula.	L4	4	8
		ii	A weir 36 meters long is divided into 12 equal bays by vertical posts, each 60 cm wide. Determine the discharge over the weir if the head over the crest is 1.2 m and velocity of approach is 2m/s.	L4	4	8
15.	a		Evaluate the rise in pressure in the impeller of a centrifugal pump through which water is flowing at the rate of 0.01 m^3/s. the internal and external diameters of the impeller are 15 cm and 30 cm respectively. The widths of the impeller at the inlet and outlet are 1.2 cm and 0.6 cm. The pump is running at 1500 rpm. The water enters the impeller radially at inlet and impeller vane angle at outlet is 45°. Neglect losses through the impeller.	L4	5	16
			Or			
	b		The cylinder bore diameter of a single acting reciprocating pump is 150mm and its stroke is 300 mm. the pump runs at 50 rpm and lifts water through a height of 25 m. The delivery pipe is 22 m long and 100 mm diameter. Find the theoretical discharge and the discharge and the theoretical power required to run the pump. If the actual discharge is 4.2 litres/s. Find the percentage slip.	L4	5	16