Register No : _____

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, NOV/DEC 2025

Third Semester

Mechanical Engineering

UMETL24303 - Fluid Mechanics and Machinery

Regulations - 2024

Duration : 3 Hrs *Maximum : 100 Marks*

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

Q.No	*Questions*	*BTL*	*CO*	*Marks*
1.	Define Specific Volume and Specific Weight.	L1	1	2
2.	What are the assumptions of the Bernoulli's equations?	L1	1	2
3.	Differentiate laminar flow and turbulent flow.	L2	2	2
4.	Compare HGL and TEL.	L2	2	2
5.	Give the dimensions of the quantities: 1. Surface Tension 2. Power.	L1	3	2
6.	Differentiate model and prototype.	L2	3	2
7.	State unit speed of turbine.	L2	4	2
8.	Differentiate impulse and reaction turbine.	L1	4	2
9.	Mention the significance of an air vessel in the reciprocating pump.	L2	5	2
10.	What are effects of cavitation?	L1	5	2

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

Q.No			*Questions*	*BLT*	*CO*	*Marks*
11.	a	i	The space between two square flat parallel plate is filled with oil. Each side of the plate is 600 mm. The thickness of oil films is 12.5 mm. The upper plate, which moves at 2.5 m/s requires a force of 98.1 N to maintain the speed. Determine: (i) The dynamic viscosity of the oil in poise (ii) The kinematic viscosity of the oil in stokes if the specific gravity of the oil is 0.95.	L3	1	8
		ii	Calculate the capillary rise in glass tube of 3 mm diameter when immersed in mercury, take the surface tension and angle of contact of mercury as 0.52 N/m and 130° respectively. Also determine the minimum size of the glass tube, if it is immersed in water, given that the surface tension of water is 0.0725 N/m and capillary rise in the tube is not to be exceed 0.5 mm.	L3	1	8
			Or			
	b	i	Derive expression for the Euler's equation and also deduce equation for the Bernoulli's equation from Euler's Equation.	L3	1	8
		ii	Find the volume of water displaced and position of center of buoyancy for a wooden block of width 2.5 m and of depth 1.5 m, when it floats horizontally in water. The density of the wooden block is 650 kg/m^3 and its length 6 m.	L3	1	8

12.	a		Three pipes of diameters 300 mm, 200 mm and 400 mm and lengths 450 m, 255 m and 315 m respectively are connected in series. The difference in water surface levels in two tanks is 18 m. Determine the rate of flow of water if coefficients of friction are 0.0075, 0.0078 and 0.0072 respectively, considering: (a) Minor losses also and (b) Neglecting minor losses.	L3	2	16
			Or			
	b	i	Derive the Darcy-Weisbach Equation to find the loss of head due to friction in pipes.	L3	2	12
		ii	What is boundary layer? Discuss briefly about the types of boundary layer.	L2	2	4
13.	a	i	How do you test the prototype of spillway? Explain with the suitable model law.	L3	3	10
		ii	Check whether the following equation is dimensionally homogeneous. $T = 2\pi\sqrt{(L/g)}$.	L3	3	6
			Or			
	b		The efficiency (η) of a fan depends on ρ (density), μ (viscosity) of the fluid, ω (angular velocity), d (diameter of rotor) and Q (discharge). Express η in terms of non-dimensional parameters. Use Buckingham's $\prod$ theorem.	L3	3	16
14.	a		A Pelton turbine is required to develop 9000 kW when working under a head of 300 m the impeller may rotate at 500 rpm. Assuming a jet ratio of 10 and an overall efficiency of 85% calculate(i) Quantity of water required, (ii) Diameter of the wheel, (iii) No of jets, (iv) No and size of the bucket vanes on the runner.	L3	4	16
			Or			
	b		An Inward flow reaction turbine has external and internal diameters as 1.0 m and 0.6 m respectively. The hydraulic efficiency of the turbine is 90% when the head on the turbine is 36 m. The velocity of the flow at outlet is 2.05 m/sec and discharge at outlet is radial. If the vane angle at outlet is 15° and width of the wheel is 100 mm at inlet and outlet, determine: 1 the Guide blade angle, 2. the speed of the turbine, 3. vane angle of the runner at inlet, 4. volume flow rate of the turbine, 5. power developed.	L3	4	16
15.	a		A Centrifugal pump having outer diameter equal to 2 times the inner diameter and running at 1000 rpm works against a total head of 40 m. The Velocity of flow through the impeller is constant and equal to 2.5 m/s. The vanes are set back at an angle of 40° at out let. If the outer diameter of impeller is 600 mm and width at outlet is 500 mm. Determine (i) Vane angle at inlet (ii) Work done per second on impeller (iii) Manometric efficiency.	L3	5	16
			Or			
	b	i	Draw a neat sketch of Reciprocating pump and explain the working principle by mentioning the relation between stroke and piston diameter.	L3	5	8
		ii	How does an indicator diagram specify the performance of a reciprocating pump?	L3	5	8