

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(AUTONOMOUS)

II B.Tech I Semester Supplementary Examinations, June- 2024

FLUID MECHANICS & HYDRAULIC MACHINES
(ME)

Time: 3 hours

Max. Marks: 70

Answer ONE Question from each Unit
All Questions Carry Equal Marks

Q. No.	Questions	BTL	CO	Marks
UNIT – I				
1.	a) What is the difference between U-tube differential manometer and inverted U-tube differential manometer? Where are they used?	K2	CO1	7M
	b) The right limb of a simple U- tube manometer containing mercury is open to the atmosphere while the left limb is connected to a pipe in which a fluid of sp.gr. 0.9 is flowing. The centre of the pipe is 12 cm below the level of mercury in the right limb. Find the pressure of fluid in the pipe if the difference of mercury level in the two limbs is 20 cm.	K3	CO1	7M
OR				
2.	a) Enunciate Newton's law of viscosity. Explain the importance of viscosity in fluid motion. What is the effect of temperature on viscosity of water and that of air?	K3	CO1	7M
	b) What is metacentric height? Determine the metacentric height by using analytical method.	K2	CO1	7M
UNIT – II				
3.	a) Derive Bernoulli's equation through Euler's equation of motion.	K3	CO2	7M
	b) For a two-dimensional potential flow, the velocity potential is given by $\phi = 4x(3y-4)$, determine the velocity at the point (2, 3) and also the value of stream function at the point (2, 3).	K3	CO2	7M
OR				
4.	a) A 42° reducing bend is connected in a pipe line, the diameters at the inlet and outlet of the bend being 40 cm and 20 cm respectively. Find the force exerted by water on the bend if the intensity of pressure at inlet of bend is 2000 N/cm^2 . The rate of flow of water is 550 litres/s.	K3	CO2	7M
	b) Derive an expression for the loss of head due to friction in a pipe line. How is the pipe coefficient f dependent on Reynolds Number	K3	CO2	7M
UNIT – III				
5.	a) What are the different methods of preventing the separation of boundary layers	K2	CO3	7M
	b) Find the displacement thickness and wall shear stress for the velocity distribution in a boundary layer $(u / U) = (y / d)$ where U is the Velocity and d is the boundary layer thickness.	K3	CO3	7M

OR					
6.	a)	A jet 120 mm in diameter moving at 20 metres per sec strikes a plate which remains at rest. Find the force exerted on the plate normal to it when i) the plate is held normal to the jet and ii) when the plate makes an angle of 60° to the jet.	K3	CO3	7M
	b)	Obtain an expression for the force exerted by a jet of water on a fixed curved plate in the direction of jet when jet strikes at center.	K3	CO3	7M
UNIT – IV					
7.	a)	A Pelton wheel has a mean bucket speed of 30 m/s with a jet of water flowing at the rate of $0.8 \text{ m}^3/\text{s}$ under a head of 250 m. The buckets deflect the jet through an angle of 160° . Calculate the power delivered to the runner and the hydraulic efficiency of the turbine. Assume co-efficient of velocity as 0.85.	K3	CO4	7M
	b)	What is specific speed? State its significance in the study of hydraulic machines.	K2	CO4	7M
OR					
8.	a)	A Kaplan turbine working under a head of 18 metres develops 18390 kW at an overall efficiency of 85%. The boss diameter is 0.3 times the runner diameter. If the velocity of flow is 9.05 m/s, calculate the discharge and the diameters of the runner and the boss.	K3	CO4	7M
	b)	Show that for the maximum efficiency, the bucket speed of a pelton wheel should be equal to one half of the jet speed.	K3	CO4	7M
UNIT – V					
9.	a)	Describe the principle and working of a reciprocating pump with a neat sketch.	K2	CO5	7M
	b)	A centrifugal pump runs at 800 rpm and delivers 5000 liters/min against a head of 7 m. The impeller has an outer diameter of 25 cm and a width of 5 cm at the outlet. If the backward curved vane at the outlet makes an angle of 45° , determine the manometric efficiency. What is the specific speed of the pump?	K3	CO5	7M
OR					
10.	a)	Explain the principle and working of a Centrifugal pump with a neat sketch.	K2	CO5	7M
	b)	A single acting reciprocating pump has a piston diameter of 150mm and stroke length of 350mm. The center of the pump is 3.5m above the water surface in the sump and 22m below the delivery water level. If the pump is working at 30 rpm, determine the power required to drive the pump.	K3	CO5	7M