R20 Regulation Subject code: 3P4CB

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech IV Semester Supplementary Examinations, February 2024

Fluid Mechanics and Hydraulic Machines
(Mechanical Engineering)

Maximum Marks: 70 Date:19.02.2024 Duration: 3 hours

	Part-A		
All the following questions carry equal marks (10X2M=20 Marks)		CO	Bloom Tx
1	Relate the absolute pressure with gauge pressure.	CO1	L2
2	Water has a surface tension of 0.4 N/m. In a 3 mm diameter vertical tube, if the liquid Rises 6 mm above the liquid outside the tube, calculate the contact angle.	CO1	L3
3	List the characteristics of vortex flow.	CO2	L2
4	Compare laminar and turbulent flow.	CO2	L4
5	Write expression for loss of head at exit of a pipe.	CO3	L2
6	Compare hydraulic gradient line with the total energy line.	CO3	L3
7	Define gross head and effective head.	CO4	L2
8	What is a draft tube? Give the uses of draft tube in a reaction turbine.	CO4	L2
9	What is meant by Priming?	CO5	L2
10	When does negative slip occur?	CO5	L2
	Part-B		
Answer All the following questions. (5X10M=50Marks)			
11	(a) List the various devices used to measure pressure and explain the working of a differential manometer. (5) (b) Discuss the important properties of fluids. (5)	CO1	L4
	OR		
12	(a) Calculate the specific weight, mass density and specific gravity of 1 litre of a liquid which weights 6.8 N. (5) (b) A flat plate of area 1.15 x 10^6 mm^2 is pulled with a speed of 0.38 m/s relative to another plate located at a distance of 0.14 mm from it. Find the force and power required to maintain this speed, if the fluid separating them is having viscosity of one poise. (5)	CO1	L4
13	The velocity components for a two dimensional incompressible flow are given by u =3x - 2y and v = -3y - 2x. Show that the velocity potential exists. Determine the velocity potential function and stream function. (10)	CO2	L4
	OR		
14	Derive the Euler's equation of motion and hence deduce Bernoulli's equation.(10)	CO2	L4

15	Describe the general characteristics of boundary layer on a flat plate including the definitions of boundary layer thickness, displacement thickness and momentum thickness with a neat sketch. (10)	CO3	L4
	OR		
16	A horizontal pipe line 40 m long in connected through a water tank at one end and discharge freely into the atmosphere at the other end. For the first 25 m of its length from the tank, the pipe is 150 mm in diameter and its diameter is suddenly enlarged to 300 mm. The height of water level in the tank is 8 m above the center of the pipe. Consider all losses. Determine the rate of flow, if f = 0.01 for both section of the pipe. (10)	CO3	L4
17	Give a detailed account of the construction and working of a Pelton wheel with a neat sketch. (10)	CO4	L4
	OR		
18	A Francis turbine with an overall efficiency of 75% is required to produce 150 kW. It is working under a head of 7.5 m. The peripheral velocity is $=0.26\sqrt{2gH}$ and the radial velocity of flow at inlet is $=0.96\sqrt{2gH}$. The wheel runs at 1540 rpm and the hydraulic losses in the turbine are 24% of the available energy. Assuming radial discharge, find (i) the guide blade angle, (ii) the wheel vane angle at inlet, (iii) diameter and width of the wheel at inlet. (10)	CO4	L4
19	A centrifugal pump discharges of 0.12 m^3/s at a speed of 1300 rpm against a head of 20 m. The diameter of the impeller is 250 mm and width at outlet is 50 mm, Manometric efficiency is 75%. Determine the vane angle at outlet of the impeller. (10)	CO5	L4
	OR		
20	Discuss the components and working of a single-acting reciprocating pump with a neat sketch. (10)	CO5	L3