R20 Regulation *Subject code: 3P3AE*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech III Semester Supplementary Examinations, February 2024

FLUID MECHANICS

(Civil Engineering)

Maximum Marks: 70 Date: 26.02.2024 Duration: 3 hours

Note: 1.This question paper contains two parts A and B.
2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

	Part-A		
All the following questions carry equal marks (10X2M=20 Marks)		CO	BTL
1	Define the concept of Pascal's law.	1	L2
2	Write the relation between specific weight and mass density	1	L2
3	Define the terms: Metacenter and metacentric height.	2	L1
4	Distinguish between surface and body forces.	2	L1
5	Write short notes on rotational and irrotational flows.	3	L1
6	What are the applications of momentum equation?	3	L2
7	Write the characteristics of turbulent flow?	4	L2
8	Define compound pipe and write its classification.	4	L1
9	Define displacement thickness?	5	L1
10	What do you understand by the term boundary layer?	5	L1
	Part-B		
Answer All the following questions. (5X10M=50Marks)			
11	(a)Find the total pressure on one face of the plate and the position of center of pressure when a circular plate 2.5m diameter is immersed in water, its greatest and least depth below the free surface being 3m and 1m respectively. [5] (b)Prove that the relationship between surface tension (σ) and pressure (p) inside a droplet of liquid in excess of outside pressure is given by $p=4\sigma / d$ [5]	1	L4 L3
	OR		
12	10 m^3 of carbon tetrachloride reduces in volume by 0.11 percent when subjected to certain pressure increase. If the bulk modulus of the fluid is 1.145×10^6 N/m^2, the original specific weight is 15,750 N/ m^3, calculate the increase in pressure and the final specific weight. [10]	1	L4
13	(a) Distinguish between: [5] (i) Steady flow and un-steady flow (ii) Uniform and non- uniform flow (iii) Compressible and incompressible flow (iv) Laminar and turbulent flow. (b) A 100 mm diameter pipe carries oil of specific gravity 0.8 which flows with a velocity of 2 m/s. At another section of the pipe, the diameter is 50 mm. Determine the mass flow rate of oil through the pipe and velocity of oil at the smaller section. [5]	2	L3 L4
	OR		

14	Determine the velocity potential function when the stream function for a two-dimensional flow is given by $\Psi = 2xy+2x^2+y^2$, also calculate the velocity at the point P(2, 3). [10]	2	L4
15	What are the applications of Venturi meter? Explain the working principle of venturi meter. Also Derive discharge of venturi meter. [10]	3	L4
	OR		
16	What are the different types of notches? Explain Rectangular, trapezoidal and Stepped notches [10]	3	L3
17	(a) Demonstrate Reynold's experiment with a neat sketch. [5] (b) A fluid of viscosity 0.7 N-s/m^2 and specific gravity 1.3 is flowing through a circular pipe of diameter 100mm. The maximum shear stress at the pipe wall is given as 196.2 N/m^2, Estimate the average velocity and Reynolds number of the flow. [5]	4	L3 L4
	OR		
18	A pipe of diameter 300 mm and length 1000 m connects two reservoirs, having difference of water levels as 15 m. Determine the discharge through the pipe. If an additional pipe of diameter 300 mm and length 600 m is attached to the last 600 m length of the existing pipe, find the increase in the discharge. Take f = 0.02 and neglect minor losses. [10]	4	L4
19	Derive Von-Karman's momentum integral equation. What is the significance of it? [10]	5	L3
	OR		
20	Find the ratios of displacement thickness to momentum thickness and momentum thickness to energy thickness for velocity distribution in the boundary layer given by $u/U=2(y/\delta)-(y/\delta)$. Where u=Velocity in the boundary layer at the distance y, U=Free-stream velocity, δ=Boundary layer thickness. [10]	5	L4