R20 Regulation

Subject code: 3P3AE

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech III Semester Regular/Supplementary Examinations, March/April 2023

FLUID MECHANICS

(Civil Engineering)

Maximum Marks: 70 Date:10.04.2023 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)

1 Write the concept of Pascal's law?
2 Derive the relation between specific weight and mass density.
3 Define Meta centre and write its concept.
4 Show that the stream lines and potential lines are perpendicular to each other.
5 Define surface forces and body forces with examples.
6 Define Orifice and write its importance.
7 Write the characteristics of turbulent flow?
8 Define compound pipe and write its equation.
9 Define boundary layer with a sketch.
10 Write the concept of Magnus effect?

Part-B

Answer All the following questions. (10M X 5=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. 5M
(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 $p=4\sigma / d$. 5M

OR

12 (a) A vertical cylinder of diameter 180mm rotates concentrically inside another cylinder of diameter 181.2mm. Both the cylinders are of 300mm height. The space between the cylinders is filled with a liquid whose viscosity is unknown. Find the viscosity of the fluid if torque of 20N-m is required to rotate the inner cylinder at 120rpm. 5M
(b) Draw the sketch of Micro manometer and discuss its application 5M

13 (a)Explain the concepts of stream line, streak line , stream tube and path line in detail 5M
(b) Determine the velocity and acceleration of a fluid particle at (2, 1, 3) at time t = 1 when the velocity vector in fluid flow is given as $V = 4x^3i - 10x^2 y j + 2tk$. 5M

OR

14 Explain law of conservation of mass and derive its continuity equation in 3-D flow. 10M

15 A 45^0 reducing bend is connected in a pipe line, the diameters at the inlet and outlet of the bend being 600mm and 300mm respectively. Estimate the force exerted by water on the bend if the intensity of pressure at inlet to bend is 8.829 N/ cm^2 and rate of flow of water is 600 liters/sec — 10M

OR

16 (a) Develop an equation of discharge through triangular notch. — 5M
(b) Water is flowing through a pipe having diameter 300mm and 200mm at the bottom and upper end respectively. The intensity of pressure at the bottom end is 24.525 N/cm^2 and the pressure at the upper end is 9.81 N/cm^2. Determine the difference in datum head if the rate of flow through pipe is 40lit/s. — 5M

17 (a) Explain Reynold's experiment with a neat sketch. — 5M
(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. — 5M

OR

18 (a) Derive Hagen Poiseiullie an equation for Laminar flow when flow takes place in a pipe. — 5M.
(b) Estimate the loss of head and power due to sudden enlargement of the horizontal pipe carrying water from a diameter of 240mm to 490mm. The flow is 0.4m^3/s and pressure in smaller pipe is 145kN/m^2. What is the pressure in larger pipe. — 5M

19 Analyze displacement thickness and momentum thickness when velocity distribution is given by $u / U = (2 y / \delta) - (y^2 / \delta^2)$ — 10M

OR

20 (a) Explain the separation of boundary layer with a neat sketch. — 5M
(b) A flat plate 2m X 2m moves at 40 km / hour in stationary air of density 1.25kg/m^3. If the co- efficient of drag and lift are 0.2 and 0.8 respectively, Calculate the lift force, the drag force & resultant force. — 5M