R20 Regulation *Subject code:3P3AE*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech III Semester Supplementary Examinations, July 2022

FLUID MECHANICS

(Civil Engineering)

Maximum Marks: 70 Date:29.07.2022 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 How does viscosity of fluid vary with temperature?
2 What do you understand by total pressure and centre of pressure?
3 Define and differentiate path line and streak line.
4 Define buoyancy and centre of buoyancy.
5 State Bernoulli's equation? Write the assumptions for such a derivation?
6 What do you understand by turbulent flow?
7 Distinguish between laminar and turbulent flow in pipes.
8 What do you understand by terms: major energy loss and minor energy losses in pipes?
9 Derive an expression for the displacement thickness.
10 Define laminar boundary layer.

Part-B

Answer All the following questions. (10M X 5=50Marks)

11 a) Explain about bourdon tube pressure gauge?
b) A simple u- tube manometer containing mercury is connected to a pipe in which a fluid of sp.gr.0.8 and having vacuum pressure is flowing. The other end of manometer is open to atmosphere. Find the vacuum pressure in pipe, if the difference of mercury level in the two limbs is 40cm and the height of the fluid in the left from the centre of pipe is 15cm below. [5+5]

OR

12 a)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 $1.145\times10^6\ N/m^2$, the original specific weight is 15,750 N/ m^3, calculate the increase in pressure and the final specific weight.
b) Define Viscosity, Surface tension and Vapor Pressure and explain their influence on fluid motion. [5+5]

13 Distinguish between: (i) Steady flow and un-steady flow, (ii) Uniform and non- uniform flow, (iii) Compressible and incompressible flow, (iv) Rotational and Irrotational flow (v) Laminar and turbulent flow. [10]

OR

14 Derive the condition for irrotational flow, prove that, for potential flow, both the stream function and velocity potential function satisfy the laplace equation. [10]

15 A vertical pipe conveying oil of specific gravity 0.8 , two pressure gauges have been installed at A and B where diameters are 16cm and 8 cm respectively. A is 2m above B . The pressure guage readings have shown that the pressure at B is greater than at A by 0.981N/cm^2. Neglecting all losses calculate the flow rate. If the gauges at A and B are replaced by tubes filled with the same liquid and connected to a U-tube containing mercury, calculate the difference of level of mercury in the two limbs of U-tube. [10]

OR

16 a) State momentum equation. How will u apply momentum equation for determining the forces exerted by a flowing liquid on pipe bend.
b) Find the discharge through a trapezoidal notch which is 1.2m wide at the top and 0.5m at the bottom 40cm in height. The head of water on the notch is 30cm assume Cd for rectangular portion is 0.62 while for triangular portion is 0.6. [5+5]

17 How will you determine the loss of head due to friction in pipes by using Darcy formula and chezy's equation? [10M]

OR

18 a) Define hydraulic gradient line and total energy line.
b) Three pipes of lengths 800m, 600m and 300m and of diameters 400mm,300mm and 200mm respectively are connected in series. The end of the compound pipe is connected to the two tanks, whose water surface levels are maintained at a difference of 15m determine the rate of flow of water through the pipes if f=0.005. What will be diameter of the single pipe of length 1700m and f=0.005, which replaces the three pipes? [5+5]

19 a) What are different methods of preventing the separation of boundary layers, explain in detail?
b) Define Boundary layer thickness, Displacement thickness, momentum thickness and Energy thickness. [5+5]

OR

20 Define laminar boundary layer, turbulent boundary layer, laminar sub layer and boundary layer thickness? [10]