R17 Regulation *Subject code:1P3AC*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech II Year I Semester Supplementary Examinations, March/April 2023

Fluid Mechanics-I

(CE)

Maximum Marks: 70 Date:01.04.2023 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 How does viscosity of fluid vary with temperature?
2 What is the difference between U-tube differential manometer and inverted U-tube differential manometer? where are they used?
3 Explain the conditions of equilibrium of floating body with neat sketches.
4 Define the terms a)velocity potential function b)stream function .
5 State Bernouli's theorem and mention assumptions underlying it.
6 List out the advantages of triangular notch over rectangular notch.
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 What are boundary conditions that must be satisfied by a given velocity profile in laminar boundary layer flows?

Part-B

Answer All the following questions. (5X10M=50Marks)

11 The shaft of diameter 100mm is rotating inside a journal bearing of diameter 102mm at a space of 360rpm. The space between shaft and bearing is filled with a lubricating oil of viscosity 5 poise. The length of the bearing is 200mm. Find the power absorbed in the lubricating oil. [10]

OR

12 A. Define manometer? How they are classified?
B. Derive an expression for the total force and depth of center of pressure from free surface of a liquid of vertical plane surface submerged in liquid. [3+7]

13 A. Define buoyancy and metacentre.
B. A wooden log of 0.8m diameter and 6m length is floating in a river water. Find the depth of wooden log in water when specific gravity of wooden log is 0.7 [3+7]

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 C_d for rectangular portion is 0.62 while for triangular portion is 0.6. [7+3]

17 Derive an expression for loss of head due to i) sudden contraction and ii) sudden enlargement of pipes. [10]

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? [4+6]

19 A. Define laminar boundary layer and boundary layer thickness?
B. A thin plate is moving in still atmospheric air at velocity of 5m/s. the length of the plate is 0.6m and width 0.4m. calculate the i)thickness of the boundary layer at the end of the plate and ii)drag force on one side of plate. Take density of air as 1.25 kg/m^3 and kinematic viscosity 0.18 stokes. [3+7]

OR

20 A. What are different methods of preventing the separation of boundary layers?
B. Obtain Von Karman momentum integral equation? [3+7]