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, July 2022

Fluid Mechanics-I

(CE)

Maximum Marks: 70 Date:23.07.2022 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 List out the examples where surface tension effects play a prominent role.
2 Define total pressure and centre of pressure.
3 What are the methods of describing fluid flow?
4 Distinguish between a) compressible and incompressible flow b)laminar and turbulent flow.
5 What is a notch?how are the notches classified?
6 What is the difference between momentum equation and impulse momentum equation and mention applications of impulse momentum equation?
7 How will you determine the loss of head due to friction in pipes by using Darcy's formula?
8 Explain the terms hydraulic gradient line and total energy lines
9 Define displacement thickness and boundary layer thickness.
10 How will you find the drag on flat plate due to laminar and turbulent boundary layers?

Part-B

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

11 a. Find the expression for the force exerted and centre of pressure for a completely submerged inclined plane surface. Can the same method be applied for finding the resultant force for a curved surface immersed in the liquid? If not, why?
b. Determine the specific gravity of a fluid having viscosity 0.07 poise and kinematic viscosity 0.042 stokes. [7+3]

OR

12 a. An inverted differential manometer containing an oil of specific gravity 0.9 is connected to find the difference of pressure at two points of a pipe containing water. If the manometer reading is 40cm. find the difference of pressures.
b. State pascal's law and hydrostatic law. Prove pascal's law. [4+6]

13 Define rotational and irrotational flow. The stream function and velocity potential for a flow are given by $\Psi=2xy$, $\phi=x^2-y^2$. Show that the conditions of continuity and irrotational flow are satisfied. [10]

OR

14 a. What do you mean by equipotential line and line of constant stream function?
b. Water flows through a pipe AB 1.2m diameter at 3m/s and then passes through a pipe BC 1.5m diameter. At C, the pipe branches. Branch CD is 0.8m in diameter and carries 1/3 of flow in AB. The flow velocity in branch CE is 2.5m/s. find the volume rate of flow in AB, velocity in BC, velocity in CD and diameter of CE. . [4+6]

15 a. Derive Euler's equation of motion. How will you obtain Bernoulli's equation from it.

b. Find the velocity of flow of an oil through a pipe, when the difference of mercury level in a differential U-tube manometer connected to the two tappings of the pitot tube is 14cm. take specific gravity of oil=0.8 and coefficient of pitot tube as 0.97 [7+3]

OR

16 a. Differentiate between broad crested weir and narrow crested weir and derive an expression for maximum discharge over a broad crested weir.

b. A rectangular notch 50cm long is used for measuring discharge of 40 litres/s. an error of 2mm was made in measuring the head over the notch . calculate the percentage of error in discharge and take C_d=0.6. [7+3]

17 a. How will you determine the loss of head due to friction in pipes by using i)Darcy's formula ii)Chezy's formula

b. Explain the terms i)Pipes in series ii) Pipes in parallel iii)Equivalent size of pipe [6+4]

OR

18 a. What you meant by equivalent pipe? Obtain an expression for equivalent pipe.

b. A horizontal pipe of diameter 500mm is suddenly contracted to a diameter of 250mm.the pressure intensities is in the large and small pipe is given as 13.734 N/cm^2 and 11.772 N/cm^2 respectively.find the loss of head due to contraction if C_c=0.62.and the determine the Rate of flow of water? [5+5]

c.

19 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]

OR

20 a. What do you mean by boundary layer separation? What is effect of pressure gradient on boundary layer separation?

b. For the velocity profile given below, state whether the boundary layer has separated or on the verge of separation or will remain attached with surface
i)$u/U=2(y/\delta)-(y/\delta)^2$ ii)$u/U=-2(y/\delta)+1/2(y/\delta)^3$
iii)$u/U=3/2\ (y/\delta)^2+1/2\ (y/\delta)^3$ [5+5]