Roll No. | | | | | | | | | | | | | **Total No. of Pages : 02**

Total No. of Questions : 09

B.Tech.(CE) (2018 Batch)(ECE) (Sem.–3)

FLUID MECHANICS

Subject Code : BTCE-303-18

M.Code : 76372

Time : 3 Hrs. **Max. Marks : 60**

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. Write briefly :

a) Define fluid and distinguish between ideal and real fluids.

b) Distinguish between surface tension and capillarity.

c) Define absolute pressure and gauge pressure.

d) Explain Laminar and Turbulent flow.

e) State Buckingham's Pi theorem.

f) Define Reynolds umber and Weber number.

g) How is turbulent motion classified?

h) State assumptions on which analysis of hydraulic jump is based upon.

i) What is meant by optimum shape of cross section of an open channel?

j) What are the limitations of Bernouli's equation?

SECTION-B

2. A stationary bearing of length 30 cm and internal radius 8.025 cm has been used to provide lateral stability to a 8 cm radius shaft rotating at a constant speed of 200 revolutions per minute. The space between shaft and bearing is filled with a lubricant having viscosity 2.5 poise. Find the torque required to overcome the friction in bearing. Take the velocity profile as linear.

3. The velocity components in x and y directions are given as :

$$u = 2xy^3/3 - x^2y \text{ and } v = xy^2 - 2yx^3/3$$

Indicate whether the given velocity distribution is :

a) a possible field of flow

b) not a possible field of flow

4. A horizontal pipe of 5cm diameter conveys an oil of specific gravity 0.9 and dynamic viscosity 0.8 kg/ms. Measurements indicate a pressure drop of 20 kN/m^2 per meter of pipe length traversed. Make calculations for the

a) Flow rate of oil and centre line velocity

b) Wall shear stress and frictional drag over 100m of pipe length

c) Power of pump required assuming an overall efficiency of 60%

d) The velocity and shear stress at 1cm from the pipe surface.

5. Calculate the friction drag on a plate 15 cm wide and 45 cm long placed longitudinally in a stream of oil (sp. Gr. 0.925 and kinematic viscosity 0.9 stokes) flowing with a free stream velocity of 6m per second. Also find the thickness of the boundary layer and shear stress at the trailing edge.

6. A 3m wide rectangular channel conveys 7.5m^3/s of water with a velocity of 5m/s. Is there a condition for hydraulic jump to occur? If so, calculate the height, length and strength of the jump. Also determine the loss of energy per kg of water.

SECTION-C

7. State and prove Pascal's law and give some examples where this principle is applied?

8. A blower having an efficiency of 75% is to supply 14 cubic meter of air per minute to a 15 cm pipe under a pressure equivalent of 5 cm of water. If the 30 cm intake pipe drawn directly from the atmosphere, what horsepower motor should be provided? What will be the pressure intensity in the intake pipe? ρ_{air} = 1.284 kg.m^3.

9. Two reservoirs are connected by a pipeline which is 15 cm in diameter for the first 5m and 25 cm in diameter for the remaining 15m. Entry to and exit from the pipe is sharp and the water surface in the upper reservoir is 7.5 m above that in the lower reservoir. Represent the layout and tabulate the head losses by assuming that the friction coefficient is 0.01 for both the pipes. Further calculate the flow rate through the arrangement and draw the hydraulic gradient and energy gradient lines.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.