

B020312(020)

**B. Tech. (Third Semester) Examination,
Nov.-Dec. 2020**

(New Scheme)

(Civil Engg. Branch)

INTRODUCTION TO FLUID MECHANICS

Time Allowed : Three hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : Attempt all questions. Part (a) of each question is compulsory. Attempt any two parts from (b), (c) and (d) of each questions.

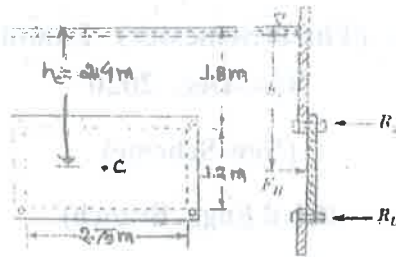
Unit-I

1. (a) Enunciate Newton's law of viscosity and distinguish between Newtonian and non-Newtonian fluids. 4
- (b) The vertical side of a reservoir has a rectangular opening 2.75 m long \times 1.2 m high. It is closed by

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a plate using 4 bolts placed at the corner of the opening. What would be the tension in the bolts if water stands to a height of 1.8 m above the top edge of the opening?

8

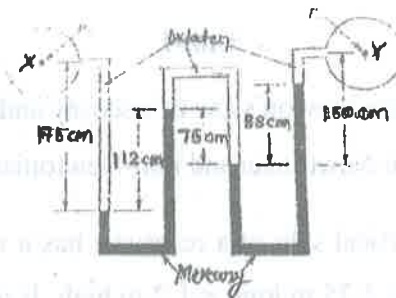


(c) On what factors does the pressure variation in the vertical direction depends? Derive the expression for pressure variation.

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(d) Two U-tube manometers are connected in series as shown in figure. Determine difference of pressure between X and Y.

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Unit-II

2. (a) What should be the acceleration in steady uniform flow?

4

(b) A fluid flows along a flat surface parallel to the x -direction. The velocity u varies linearly with y , the distance from the flat surface, that is $u = Ay$.

8

(i) Find the stream function of the flow

(ii) Determine whether or not the flow is irrotational

(c) Is the flownet analysis applicable to rotational flow? If not, why?

8

(d) Show that the stream lines and equipotential lines from a net of mutually perpendicular lines.

8

Unit-III

3. (a) Describe the nature of various forces included in the momentum equation.

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(b) A venturimeter is to be fitted in a 150 mm dia. Pipeline horizontally at a section where the pressure is 100 kN/m^2 . If the maximum flow of water in the

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pipe is 150 litres/sec, find the diameter of the throat so that the pressure at the throat does not fall below 75 kN/m² (vacuum). Assume that 3% of the differential head is lost between the inlet and throat. 8

- (c) "Bernoulli's equation is a special case of the generalized energy equation." Comment on the validity of this statement. 8
- (d) What condition leads to cavitation? Is cavitation possible in a free surface flow? 8

Unit-IV

4. (a) What are the different causes of loss of energy in pipe flow? 4
- (b) What do you understand by best hydraulic channel cross section? In how many ways can you express it? 8
- (c) Derive the expression and sketch the velocity and shear stress distribution across the flow in a circular pipe (for fully developed laminar flow). 8
- (d) Determine the dimensions of an economical

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trapezoidal section of an open channel with side slope 2 H : 1 V laid at a slope of 1 in 1600 to carry a discharge of 36 m³/s. Assume Chezy's coefficient $C = 50$. 8

Unit-V

5. (a) Why should the coefficient of velocity be less for mouthpiece as compared to orifices? 4
- (b) What are the various methods for measuring the flow in open channel? Discuss the limitations of each. 8
- (c) Differentiate between a sharp-crested and a broad crested weir. 8
- (d) What are the advantages of a triangular weir over a rectangular one? Which one is better suited for a wide range of discharge variation? 8