

Seat
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BAI1311

Fluid Mechanics - I
(New) (1100)

P. Pages : 2

Time : Three Hours

Max. Marks : 100

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answersheet should be written with blue ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Solve **any two** bits from each unit.
5. Assume suitable data if necessary.
6. Figures to right indicate full marks.
7. Use of non programmable calculator is allowed.

UNIT - I

1. a) A vertical gap 2.2 cm wide of infinite extent contains a fluid of viscosity 2.0 N.S/m^2 and specific gravity 0.9. A metallic plate $1.2\text{m} \times 1.2\text{m} \times 0.2\text{cm}$ is to be lifted up with a constant velocity of 0.15 m/sec through the gap if the plate is in middle of gap. Find force required. The weight of plate is 40 N. 10
- b) Show that the centre of pressure of lamina immerded under liquid is always below the centroid. 10
- c) A vertical sluice gate is used to cover an opening in a dam. The opening is 2m wide and 1.2 m high on the upstream of the gate the liquid of sp. grav 1.45 lies upto a hight of 1.5m above the top of gate whereas on the down stream side the water is available upto a light touching the top of gate. Find the resultant force acting on the gate and position of centre of pressure find also the force acting horizontally at the top of gate which is capable of opening it, Assume that gate is hinged at bottom. 10

UNIT - II

2. a) Derive an expression for discharge through venturimeter. Also draw sketch of venturimeter showing direction of flow. 10
- b) A horizontal venturimeter with inlet drameter 20 cm and throat diameter 10 cm is used to measure the flow of oil of sp. gr. 0.8 The discharge of oil through venturimeter is 60 lit / sec Find the reading of oil mercury differential manometer. Take $C_d = 0.98$. 10

- c) Write short note on.
- i) Pitot tube. 5
 - ii) Orifice meter. 5

UNIT - III

3. a) The pressure difference Δp in a pipe of diameter D and length l due to turbulent flow depends on velocity V , viscosity μ , density ρ and roughness K . Using Buckingham's π theorem obtain an expression for Δp . 10
- b) Calculate a) pressure gradient along flow b) Average velocity
- c) Discharge for an oil of viscosity 0.02 N-s/m^2 following between two stationary parallel plates 1m wide maintained 1cm apart. The velocity midway between the plates is 2m/sec. 10
- c) Write short note on.
- i) Reynold experiment for classifying laminar and turbulent flow. 5
 - ii) Dimensionless number. 5

UNIT - IV

4. a) i) Water flows over a rectangular weir 1m wide at a depth of 15cm and afterward passes through a triangular right angled weir. Taking C_d for rectangular and triangular weir as 0.62 and 0.59 respectively Find the depth of triangular weir. 8
- ii) What are advantages of triangular notch over rectangular notch. 2
- b) Derive an expression for discharge through large rectangular orifice. 10
- c) Write short note on.
- i) Classification of Mouthpieces. 5
 - ii) Hydraulic Co-efficients. 5

UNIT - V

5. a) Derive expression for discharge through open channel by chezy's formula. 10
- b) The discharge of water through a rectangular channel of width 8m is $15 \text{ m}^3/\text{sec}$ when the depth of flow of water is 1.2m Calculate.
- i) Specific energy of the flowing water.
 - ii) Critical depth and critical velocity.
 - iii) Value of minimum specific energy. 10
- c) Write short note on.
- i) Empirical formulae for value of chezy's constant. 5
 - ii) Specific energy curve. 5
