

Roll No. ....

Total No. of Questions : 09]

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## Paper ID [A0602]

(Please fill this Paper ID in OMR Sheet)

B.Tech (Sem.- 3<sup>rd</sup>)

FLUID MECHANICS - I (CE-203)

Time : 03 Hours

Maximum Marks :60

### Instruction to Candidates:

- 1) Section - A is **Compulsory**.
- 2) Attempt any **Four** questions from Section - B.
- 3) Attempt any **Two** questions from Section - C.

### Section - A

Q1)

(10 × 2 = 20)

- a) Define Newton's law of viscosity.
- b) Differentiate between Laminar flow & turbulent flow.
- c) State Pascal's law & give some applications.
- d) List any two uses of Flow net.
- e) List main applications of Bernoulli Equation.
- f) Differentiate between Kinematic Similarity and Dynamic Similarity.
- g) Define Vena contracta.
- h) If  $\mu = x + y + z$ ,  $\nabla^2 = -xy - yz - xz$ ; determine the velocity component  $w$ , which will satisfy continuity equation for incompressible fluid.
- i) A model of reservoir is completely drained in 20 minutes by means of a sluice gate. If the model is built to a scale 1:1000, what time will be required to drain the prototype?
- j) What is the advantage of Cippoletti Weir?

### Section - B

(4 × 5 = 20)

- Q2) A thin plate of very large area is placed in a gap of height 'h' with oils of viscosities  $\mu_1$  and  $\mu_2$  on the two sides of the plate. The plate is pulled at a constant velocity V. Calculate the position of the plate so that.
- The shear force on the two sides of the plate is equal.
  - The force required to drag the plate is minimum.

Assume viscous flow and neglect all end effects.

- Q3) State and explain Buckingham's  $\Pi$ -theorem. How is choice of repeating variables made.
- Q4) At a sudden enlargement of a pipeline from a diameter of 30cm to 55cm, the hydraulic gradient line rises 13cm. Estimate the discharge, if the pipe is horizontal.
- Q5) Water flows over a rectangular weir 1m at a depth of 15cm. Afterwards, water passes through a triangular right angled weir. Find the depth of water through the triangular weir? Discharge coefficients for rectangular and triangular weirs are 0.62 and 0.57 respectively.
- Q6) A piece of wood (specific gravity = 0.7) of 10cm square in cross-section and 2.5m long floats in water. How much lead (specific gravity = 12) need to be fastened at the lower end of the stick so that it floats upright with 0.5m length out of water?

### Section - C

(2 × 10 = 20)

- Q7) Derive Bernoulli's equation from general energy equation.
- Q8) Define the following.
- Streamline.
  - Stream function.
  - Pathline.
  - Convective acceleration.
  - Cavitation.
- Q9) Show that in a venturimeter, the quantity of water passing through will be proportional to the measured Venturi head H, if the head lost in friction is proportional to the head difference due to increased velocity.

