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INTERNATIONAL CENTRE FOR APPLIED SCIENCES (MAHE)

III SEMESTER B.Sc. (Applied Sciences) MAKE -UP EXAMINATION – January 2022 SUBJECT: FLUID MECHANICS (IME 234)

(BRANCH: MECHANICAL)

Timing: 3 hours

DATE: 12th January 2022

Max. Marks: 50

✓ Answer All questions

Missing data, if any, may be suitably assumed

- 1A Define the following fluid properties. Also mention their units.i) Mass density ii) Specific weight iv) Specific gravity iii) Kinematic viscosity
- 1B State and derive hydrostatic law.
- 1C The space between two square flat parallel plates is filled with oil. Each side of the plate is 500 mm. The thickness of the oil film is 20 mm. The upper plate moves at a uniform velocity of 3.2 m/sec when force of 100 N is applied to upper plate. Find i) Shear stress ii) Dynamic viscosity of oil in poise iii) Power absorbed in moving plate iv) Kinematic viscosity in stokes Take specific gravity of the oil as 0.9

(2+3+5=10 Marks)

- 2A Derive expressions for total pressure and centre of pressure for vertical surface submerged in liquid
- 2B An inverted U -tube differential manometer is connected to horizontal pipes A and B through which water is flowing. Vertical distance between the axes of the pipes is 30 cm. When the oil of specific gravity 0.8 is used as a gauge fluid, the vertical heights of water columns in two limbs of inverted manometer are found to be same and equal to 35 cm when measured from respective centre lines of pipes. Pipe B lies below pipe A. Find the pressure difference between A and B.
- 2C Express the following pressures in N/m^2 : i) 10 Kgf/cm² ii) 300 mm of mercury.

(5+3+2=10 Marks)

- 3A Explain briefly: i) Uniform and non-uniform flow ii) Laminar and turbulent flow iii) Compressible and incompressible flow.
- 3B Deduce Bernoulli's equation starting from Euler's equation. State the assumptions.
- 3C A conical tube is fixed vertically with its smaller end upwards and it forms a part of pipeline carrying oil of sp.gravity 0.9. The diameter at smaller end is 100 mm and at the larger end is 175 mm. Length of the conical tube is 1.5 m. The pressure at the upper end is equivalent to head of 10m of water. Determine the pressure at the lower end tube if the head loss in the tube is $0.2(V_1^2 V_2^2)$

2g where V₁ and V₂ are the velocities at smaller and larger end respectively and oil flows at a rate of 30 kg/sec in the pipeline in downward direction.

(2+3+5=10 Marks)

- 4A State and explain Buckinghams π -theorem.
- 4B Derive an expression for actual discharge through V-notch.
- 4C Horizontal venturimeter with pipe to throat diameter ratio 2:1 is used to measure the flow of water of pipe 20 cm. The pressure head at the inlet is 18 m of water and the vacuum pressure at the throat is 30 cm of mercury. Find the discharge of water through the venturimeter. Take $C_d=0.98$.

(2+4+4=10 Marks)

- 5A Derive Hagen Poiseuille's formula for loss of head due to viscous flow through pipe.
- 5B Derive Darcy-weisbach equation to find head loss due to friction and deduce Chezzy's equation from it.

(5+5=10 Marks)