Question Paper

Exam Date & Time: 10-May-2019 (09:30 AM - 12:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

INTERNATIONAL CENTRE FOR APPLIED SCIENCES
III SEMESTER B.Sc. (APPLIED SCIENCES) IN ENGENEERING
END SEMESTER THEORY EXAMINATION APRIL / MAY 2019
FLUID MECHANICS [IME 234]

Marks: 100 **Duration: 180 mins.**

Answer 5 out of 8 questions.

Any missing data if any, may be suitably assumed.

1)		Classify the various types of fluids with the help of a diagram and briefly explain them.	(10)
	A)		
	B)	An oil film of thickness 1.5 mm is used to for lubrication between a square plate of size 0.9 m x 0.9 m and an inclined plane having an angle of inclination 20^{o} with the horizontal. The weight of the square plate is 392.4 N and it slides down the plane with a uniform velocity of 0.2 m/s. Find the dynamic viscosity of oil.	(4)
	C)	State and prove hydrostatic law.	(6)
2)		The right limb of a simple U-tube manometer containing Hg is open to atmosphere while the left limb is connected to a pipe in which a fluid of specific gravity 0.9 is flowing. The centre of the pipe is 12 cm below the level of Hg in the right limb. Find the pressure of fluid in the pipe if the difference of Hg level in the two limbs is 20 cm.	(10)
	A)		
	B)	Describe absolute, gauge, atmospheric and vacuum pressures with neat sketch.	(10)
3)		A vertical sluice gate is used to cover an opening in a dam. The opening is 2m wide and 1.2m high. On the upstream of the gate, the liquid of sp. Gr. 1.45, lies upto a height of 1.5 m above the top of the gate, whereas the downstream side the water is available upto a height touching the top of the gate. Find the resultant force acting on the gate and position of centre of pressure. Find also force acting horizontally at the top of the gate which is capable of opening it. Assume the gate is hinged at the bottom.	(10)
	A)		
	B)	Derive and expression for total pressure and centre of pressure for a vertical submerged plate.	(10)
4)		Explain the following: i) steady and unsteady flows, ii) uniform and non-uniform flows, iii) laminar and turbulent flows, iv) compressible and	(10)
	A)		

incompressible flows, v) Newtonian and non - Newtonian Fluids

B) The diameters of the pipe at sections (1) and (2) are 15cm and 20cm respectively. Find the discharge through the pipe if the velocity of water at section (1) is 4m/s. Also, determine the velocity at section (2). (10)

5) Derive Bernoulli's equation from Euler's equation. (10)

A)

B) A pipeline carrying oil of specific gravity 0.87, changes in diameter from 200 mm diameter at a position A to 500 mm diameter at a position B which is 4 m higher than that at A. If the pressures at A and B are 1 kg/cm^2 and 0.6 kg/cm^2 respectively and the discharge is 200 lirres/s, determine the loss of head and direction of flow. (10)

6) Explain Reynold's experiment with neat sketch. (10)

A)

B) A smooth pipe of diameter 400 mm and length 800 mm carries water at the rate of 0.04 m^3/s. Determine the head lost due to friction, wall shear stress, centre line velocity and average velocity. Take kinematic viscosity of water as 0.018 stokes. (10)

7) A horizontal pipe line 40 m long is connected to a water tank at one end and discharges freely into the atmosphere at the other end. For the first 25 m of its length from the tank the pipe is 150 mm diameter and its diameter is suddenly enlarged to 300 mm. the height of water level in the tank is 8 m above the centre of the pipe. Considering all losses of head which occurs, determine rate of flow. Take f = 0.01 for both sections of pipe. (12)

A)

B) Calculate the loss of head in a pipe having a diameter of 15cm and a length of 2km. It carries oil of specific gravity 0.85 and viscosity of 6 stokes at the rate of 30.48 lps (Assume laminar flow). (8)

8) Derive an expression for velocity gradient for flow of viscous fluid between two parallel plates. (12)

A)

B) The rate of flow of water through a horizontal pipe is 0.25 m^3/s. The diameter of the pipe which is 200 mm is suddenly enlarged to 400 mm. The pressure intensity in the smaller pipe is 11.772 N/cm^2. Determine: (i) loss of head due to sudden enlargement, (ii) pressure intensity in the large pipe, (iii) power lost due to enlargement. (8)

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