Code No. 2045

FACULTY OF ENGINEERING

B.E. 2/4 (Civil) II-Semester (Main) Examination, April / May 2013

Subject : Fluid Mechanics - I

Time : 3 Hours **Max. Marks: 75**

Note: Answer all questions of Part - A and answer any five questions from Part-B.

PART – A (25 Marks)

1. Differentiate between notch and weir. (2)
2. What is hydrostatic variation of pressure force? (2)
3. Define momentum correction factor. (2)
4. What do you mean by velocity of approach in a notch? (2)
5. Define temporal acceleration. (2)
6. Darcy-Weisbach equation can be used only for turbulent flows-yourcomment. (3)
7. What is meant by lower critical Reynolds number in pipe flows? (3)
8. Define Stream function and velocity potential. (3)
9. What is Mach cone? (3)
10. What is an equivalent pipe? (3)

PART – B (5x10=50 Marks)

11.(a) Derive the expression for variation of pressure in a static fluid. (5)

(b) A hydraulic lift consists of a 28cm diameter ram which slides in a 28.015cm diameter cylinder, the annular space being filled with oil having kinematic viscosity of 0.025 cm^2/s and specific gravity 0.85. If the rate of travel of the ram is 10.15 m/min, find the frictional resistance when 3.25m of the ram is engaged in the cylinder. (5)

12.(a) Derive Bernoulli's equation from Euler's equation of motion clearly stating the assumptions involved. (5)

(b) A pipe bend tapers in the direction of flow from a diameter of 500mm to a diameter of 250mm and turns through 450 in the horizontal plane. The pressure at inlet is 40 kPa. If the pipe is conveying oil of specific gravity of 0.85, find the magnitude and direction of the resultant force on the bed when the oil flows at a rate of 150 litres / s. (5)

13.(a) Derive the expression for discharge through a Venturimeter fitted to an inclined pipe line. (5)

(b) In an experiment on a 90^o V-notch the flow is collected in vertical cylindrical tank 0.9m diameter. It is found that the depth of water in the tank increases by 0.65 m in 16.8 s when the head over the notch is 0.2m. Determine the coefficient of discharge through the notch. (5)

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14.(a) Derive the equation for velocity of pressure wave or elastic wave in a compressible fluid. (5)

(b) Air is flowing through a pipe with a velocity of 285m/s where its pressure temperature are 0.6 bar (absolute) and 300K. The pipe along the flow changes in diameter and its pressure at that section is 0.9 bar (absolute). Taking Y as 1.4 and R as 287Nm/kg0K, and assuming the adiabatic flow, find the velocity of flow at this section. (5)

15.(a) Explain the concept of equivalent pipe and generate the relevant expression. (5)

(b) Oil of viscosity 0.1 Pa-s and specific gravity 0.9, flows through a horizontal pipe of 25 mm diameter. If the pressure drop per metre length of the pipe is 12kPa, determine (i) the rate of flow in N/min (ii) the shear stress at the pipe wall (iii) the Reynolds number of the flow (iv) the power required per 50m length of pipe to maintain flow. (5)

16.(a) Derive the expression for loss of energy due to sudden contraction in a circular pipe. (5)

(b) Oil of specific gravity 0.9 flows in a 300mm diameter at the rate of 120 litres per second and the pressure at a point A is 24.525 kPa. If the point A is 5.2 m above the datum line, calculate the total energy at point A in terms of meters of oil. (5)

17. Write short notes on the following:

(a) Rotameter (3)

(b) Pascal's Law (3)

(c) Vapour pressure (4)

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