Paper / Subject Code: 50805 / Fluid Machanics-I

SE - Civil Sem - III FM-1 Choice Based 17 DEC 2018

(Three Hours) 80 Marks

N.B. (I) Question No 1 is compulsory

(ii) Attempt any Three questions out of Five questions

(iii) Illustrate with figures whenever necessary

(iv) Assume suitable data if necessary and state it clearly

1 Solve any Four [20]

a) What are different types of fluids?
b) What do you mean by velocity potential function and stream function?
c) Define the terms (i) source (ii) sink (iii) Doublet
d) What do you mean by velocity of approach? What will be discharge through rectangular notch if velocity of approach is considered?
e) Calculate the pressure intensity due to depth of 0.5 m of (i) water (ii) mercury (iii) an oil of specific gravity 0.85
f) What are different types of fluid flows?

2 (a) (i) For having a blood sample a fine glass of capillary of diameter 2 mm was held on freshly punctured finger tip. Estimate in ML the volume of blood sample so drawn. Take surface tension as 5×10^{-2} N/m and its contact angle with glass as zero degree. Take density of blood as 1060 kg/m^3 [5]

2 (a) (ii) A 2 cm wide gap between two vertical plane surfaces is filled with an oil of specific gravity 0.85 and of dynamic viscosity 2.5 N.s/m^2. A metal plate 1.25 m x 1.25 m x 0.2 cm thick and weighing 30 N is placed midway in the gap. Find the force required if plate is to be lifted with a constant velocity of 0.12 m/s [10]

2 (a) (iii) State and prove the Pascal's Law. [5]

3 (a) A vertical gate 6 m long and 2 m wide is hinged at 0.15 m below the centre of gravity of gate. The total depth of water is 14 m. What horizontal force is required at the bottom of gate to keep it closed? [10]

3 (b) Explain why a 3 m cylindrical buoy 4.2 m long and weighing 4.1 tonnes can not float in water? [10]

4 (a) A closed cylindrical vessel of length 50 cm and diameter 30 cm contains water up to a height of 80 cm. The cylinder is rotated at a speed of 250 rpm about its vertical axis. Find the height of paraboloid formed. [10]

4 (b) Obtain an expression for continuity equation for a three dimensional flow. **[10]**

5 (a) A 150 mm x 75 mm venturimeter with a coefficient of discharge 0.98 is to be replaced by an orifice meter having a coefficient of discharge 0.6. If both the meters are to give same mercury manometer reading for a discharge of 100 lit/s and the inlet diameter is to remain 150 mm, what would be the diameter of orifice ? **[10]**

5 (b) A pipe line carrying oil of specific gravity of 0.8 changes in diameter from 300 mm at position 1 to 600 mm diameter at position 2 which is 5 meters at a higher level. If the pressures at positions 1 and 2 are 100 KN/m^2 and 60 KN/m^2 respectively and discharge is 300 litres/sec, determine **[10]**

(i) Loss of head

(ii) Direction of flow

6 (a) (i) The maximum flow through a rectangular channel is 2.2 m deep and 3 m wide is $1.8 m^3/s$. Find the maximum height at which the crest of the weir may be installed so that water will not overflow the side of the channel. Take $C_d = 0.62$ **[5]**

6 (a) (ii) Prove that an error of 1 % in the measurement of head will produce an error of 2.5 % in the measurement of discharge over a triangular notch. **[5]**

6 (b) (i) A tank 1 m x 1m in area has a 20 mm diameter orifice at its bottom. Initially the depth of water is 4 m. Find time taken for the water surface to drop by 1 m. **[5]**

6 (b) (ii) Give the classification of mouthpieces **[5]**

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