

SE Civil III (old)

FM-I

(3 Hours)

29.12.16
Q.P. Code : 537601

[Total Marks : 100]

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- N.B. :** (1) Question No.1 is **compulsory**.
(2) Solve **any four** questions out of remaining.
(3) Assume **data** wherever **necessary** and **clearly mention** the assumptions made.
(4) **Draw neat figures** as required.

1. Answer **any four** of the following :

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- Derive Bernoulli's equation from Euler's equation.
- Enlist Mechanical Pressure Gauges and explain **any one**.
- Write a note on Capillarity and Surface Tension.
- Explain Source, Sink and Doublet.
- Explain Stability conditions for floating bodies..

2. (a) A square plate $600 \text{ mm} \times 600 \text{ mm}$ weighing 245 N slides down an inclined plane with a uniform velocity of 0.30 m/s . The inclined plane slopes downward at a slope of $2.4\text{H}:1 \text{ V}$ and is provided with a 1 mm thick oil film. Find the dynamic viscosity of the oil.

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(b) A pipe 300 m long has a slope of 1 in 100 and tapers from 1 m diameter at the higher end to 0.5 m at the lower end. The quantity of water flowing is 900 l/s . If the pressure at the higher end is 70 kPa , find the pressure at the lower end.

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3. (a) Write short notes on Ideal fluid, Newtonian fluid, Non-Newtonian fluid, Ideal Plastic fluid and Thixotropic fluid.

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(b) If $\Phi = 3xy$, find x and y components of velocity at $(1, 3)$ and $(3, 3)$. Determine the discharge passing between streamlines passing through these points.

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TURN OVER

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4. (a) A square surface $3\text{m} \times 3\text{m}$ lies in a vertical plane. Determine the position of the center of pressure and the total force on the square, when its upper edge is (a) in water surface and (b) 15 m below the water surface. 10
- (b) A horizontal venturimeter $160\text{mm} \times 80\text{mm}$ is used to measure the flow of an oil of specific gravity 0.8. Determine the deflection of the oil mercury gauge, if the discharge of the oil is 50 l/s . take coefficient of venturimeter as 1. 10
5. (a) A differential manometer connected at two points A and B at the same level in a pipe containing an oil of specific gravity 0.8, shows a difference in mercury levels as 100 mm. Determine the difference in pressures at the two points. 10
- (b) Derive the equation for discharge through Orificemeter. 10
6. (a) An open cylindrical vessel 180 mm in diameter and 450 mm deep is filled with water upto the top. Estimate the, volume of water left in the vesse when it is rotated about its vertical axis with a speed of 400 rpm. 10
- (b) The loss of energy head in the flow through a 60 mm diameter orifice under a certain head is 0.18 m of water. The velocity of the jet is 7.05 m/s. If the coefficient of discharge is 0.62 find (i) the head of water over the orifice (ii) the diameter of the jet (iii) coefficient of velocity. 10
7. (a) A cippoletti weir with a crest width of 400 mm discharges water, the head over the crest being 250 mm. if the channel of approach is 600 mm wide and 450 mm deep, find the discharge Take $C_d = 0.62$. 10
- (b) A cylindrical buoy of 3 m diameter and 4m long is weighing 150 kN. Show that it cannot float vertically in water. 10