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320352(20)

B. E. (Third Semester) Examination, Nov.-Dec. 2021

(New Scheme)

(Civil Engg. Branch)

FLUID MECHANICS-I

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : *Attempt all questions. Part (a) from each question is compulsory. Attempt any* ***two*** *parts from part (b), (c) & (d) of each questions.*

Unit-I

1. (a) What do you understand by vacuum pressure? 2

(b) Explain the following : 7

(i) Pascal's law

(ii) Differential manometer

(iii) Centre of Pressure

(iv) Buoyancy

(c) A cubical tank has sides of 1.5 m. It contains water for the lower 0.6 m depth. The upper remaining part is filled with oil of specific gravity 0.9. Calculate for one vertical side of tank : 7

(i) Toal Pressure

(ii) Position of centre of pressure

(d) A rectangular pontoon is 5 m long, 3 m wide and 1.20 m high. The depth of immersion of the pontoon is 0.80 m in sea water. If the centre of gravity is 0.6 m above the bottom of the pontoon, determine the meta-centre height. The density for sea water = 1025 Kg/m^3. 7

Unit-II

2. (a) Write convective & local acceleration. 2

(b) Water flows through a pipe AB 1.2 m diameter at 3 m/s and then passes through a pipe BC 1.5 m diameter. At C the pipe branches, Branch CD is 0.8 7

m in diameter and carries one-third of the flow in AB. The flow velocity in branch CE is 2.5 m/s. Find the volume rate of flow in AB, the velocity in BC, the velocity in CD and the diameter of CE.

(c) Derive continuity equation of liquid flow based on conversion of mass principles. 7

(d) The strean function for a two dimensional flow is given by $\psi = 2xy$. Calculate the velocity at the point P (2, 3). Find the velocity potential function ϕ. 7

Unit-III

3. (a) Define Bernoull's equation & what are the assumptions. 2

(b) The water is flowing through a taper pipe of length 100 m having diameters of 600 mm at upper end 300 mm at the lower end at the rate of 50 lit/s. The pipe has a slope of 1 in 30. Find the pressure at the lower end if the pressure at the higher level is19.62 N/cm^2. 7

(c) A 45° deflection angle reducing bend lies in a horizontal plane and tapper from 60 cm diameter to 30 cm diameter at the outlet. The pressure at the inlet is 15 kPa and the flow through the bend is 0.5 m^3/s of water. Computer the magnitude and direction of force exerted by water on the bend. 7

(d) Explain the following : (any **two**) 7

(i) Euler's equation of motion.

(ii) Pitot tube

(iii) Moment of momentum equation

Unit-IV

4. (a) Define open channel flow. 2

(b) Derive the expression for discharge for laminar flow through circular pipe. 7

(c) Derive an expression for the loss of head due to sudden contraction of pipe. 7

(d) A trapezoidal channel with side slopes 3 horizontal to 2 vertical has to be designed to carry 10 m^3/sec 7

at a velocity of 1.50 m/sec. So that the amount of concrete lining for the bed and side is minimum field :

(i) The wetter perimeter

(ii) Slope of the bed Manning's N = 0.014

Unit-V

5. (a) Compare orifice and mouthpiece. 2

(b) A tank has two identical orifices in of its vertical sides. The upper orifice is 3 m below the water surface and lower one is 5 m below the water surface. If the value of C_v for each orifice is 0.96. Find the point of intersection of the two jets. 7

(c) Explain the different "Hydraulic Co-efficients". 7

(d) A braod crested weir of 50 m length has 50 cm height of water above its crest. Find the maximum discharge take $C_d = 0.60$. Neglect velocity of approach of velocity of approach is to be taken in to consideration. Find maximum discharge when the channel has a cross-sectional area of 50 m^2 on the upstream side. 7