320312 (20)

BE (3rd Semester)
Examination, Nov.-Dec., 2021
Branch : Civil

FLUID MECHANICS - I

Time Allowed : Three Hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : Part (a) in each unit is compulsory. Select any

two from b, c, d of each unit.

UNIT - I

Q. 1. (a) Define the weight density and specific

gravity of fluid. 2

(b) Enunciate Newton's law of viscosity. Explain the importance of viscosity in fluid motion. What is effect of temperature on viscosity of water and that of air ?   7

(c) Define centre of pressure. Derive an expression for depth of centre of pressure of an immersed surface from surface of liquid.   7

(d) A rectangular plane surface is 2m wide and 3 m deep. It lies in vertical plane in water. Determine total pressure and position of centre of pressure on the plane surface when its upper edge in horizontal and

(i) concoides with water surface.

(ii) 2.5 m below the free water surface. **7**

UNIT - 2

Q. 2. (a) Explain the term 'path line". **2**

(b) Define the following and give one practical

example of each : **7**

(i) Laminar flow.

(ii) Turbulent flow.

(iii) Steady flow

(iv) Uniform flow

(c) If for a two dimensional potential flow, the

velocity potential is given by

$$\phi = x(2y - 1)$$

determine the velocity at the point p(4, 5).

Determine also the value of stream function

Ψ at the point P.   7

(d)   Derive continuity equation of liquid flow

based on conservation of mass principal. 7

UNIT - III

Q. 3.   (a)   Explain pitot tube.   2

(b)   What is venturimeter ? Derive an expression

for discharge through venturimeter.   7

(c)   State Bernoulli's theorem for steady flow of

an   incompressible   fluid.   Derive   an

expression for Bernoulli's equation, from

first principal.   7

(d) A water is flowing through a pipe having diameters 20 cm and 10 cm at section 1 and 2 respectively. The rate of flow through pipe is 35 litres/s. The section 1 is 6 m above datum and section 2 is 4 m above datum. If the pressure at section 1 is 30.24 N/cm². Find intensity of pressure at section 2.   7

UNIT - IV

Q. 4. (a) What do you understand by "equivalent pipe"?   2

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

(c) Explain the following : 7

    (i) Minimum Specific Energy

    (ii) Critical Depth.

    (iii) Critical Velocity.

    (iv) Alternate Depth.

(d) A trapezoidal channel has side slopes of 1 horizontal to 2 vertical and the slope of the bed is 1 in 1500. The area of the section is 40 m². Find the dimensions of the section if it is most economical. Determine the discharge of the most economical section if C = 50. 7

UNIT - V

Q. 5. (a) Define co-efficient of contraction and

coefficient of discharge.   2

(b) Explain the classification of orifices and

mouth pieces based on their shape, size

and sharpness.   7

(c) Derive equation for discharge through

rectangular notch.   7

(d) (i) Define cavitation.   2

(ii) A broad crested weir of 50 m length,

has 50 cm height of water above its

crest. Find the maximum discharge.

Take Cd = 0.60 Neglect velocity of approach if velocity of approach is to be taken into consideration. Find maximum discharge when the channel has a cross-sectional area of 50 m^2 on the upstream side.   5