

B.TECH 3RD SEM.

FLUID MECHANICS -1

PAPER: CE -205 –F

DEC - 2010

SECTION - A

Q.NO. 1 (a).

Define the fluid properties density , sp. Weight , surface tension , and sp. Volume.

04

Q.NO. 1 (b).

Derive an equation for the capillary depression of water in a glass tube immersed in mercury.

06

Q.NO. 1(c).

A rectangular plate of size 25 cm by 50 cm and weighing 250 N slides down a 30° inclined surface at a uniform velocity of 2 m/s. If the uniform 2 mm gap b/w the plate and inclined surface is filled with oil. Determine the viscosity of oil.

10

Q.NO. 2(a) Define the following lines of flow :-

(I) stream line.

(ii) streak line

(iii) path line.

2×3= 06

Q.NO. 2(b) Write four properties of flow net.

04

Q.NO. 2(c) Two velocity components are given below. Find the third component such that they satisfy continuity equation.

(i) $u = x^3 + y^2 + 2z^2$, and $v = x^2y - yz - xy$

(ii) $u = 2x^2 + 2xy$, and $w = z^3 - 4xz - 2yz$

5×2=10

SECTION –B

Q.NO. 3(a) Draw a neat sketch to show the absolute zero pressure , absolute pressure , gauge pressure , vacuum pressure and atmospheric pressure.

04

Q.NO. 3(b) The pressure due to an oil of height ' h ' meter is $2 \times 10^4 \text{ N/m}^2$. The specific gravity of oil is 0.9 . Find the height of oil 'h ' in meters.

06

Q.NO. 3(c) Explain with neat sketches of the following :-

(i) Piezometer

(ii) U tube manometer

(iii) Single column manometer

10

Q.NO. 4(a) A triangular gate which has base of 1.5 m and an altitude of 2m lies in a vertical plane and tank which contains oil of specific gravity of oil is 0.8 . Find the total pressure exerted by the oil on the gate and the position of the centre of the pressure. 10

Q.NO. 4(b) A wooden block of rectangular section 1.25 m wide , 2m deep and 4m long floats horizontally in sea water . if the specific gravity of wood is 0.64 and water weighs 10055 N/m^3 , find the volume of the liquid displaced and the position of the centre of buoyancy. 10

SECTION-C

Q.NO. 5(a) Explain venturimeter and orifice meter with sketches.

10

Q.NO. 5(b) A 0.3m pipe carries water at a velocity of 24.4 m/s . At point A and B measurements of pressure and elevations were respectively 361 KN/m^2 and 288 KN/m^2 and 30.5m and 33.5m . For steady flow, find the loss of head b/w A and B.

10

Q.NO. 6(a) Define the following;

- (i) Coefficient of velocity
- (ii) Coefficient of Contraction
- (iii) Coefficient of Discharge

2×3 = 06

Q.NO. 6(b) A rectangular notch of crest length 0.4m is used to measure the flow of water in a rectangular channel 0.6m wide and 0.45m deep. If the water level in the channel is 0.225m above the weir crest , find the discharge in the channel for the following two cases.

For the notch assume coefficient of discharge (C_d) = 0.63

(i) Neglecting velocity of approach

06

(ii) Taking into account velocity of approach

08

SECTION –D

Q.NO. 7(a) Explain the following :

(i) Boundary layer thickness

(ii) Laminar boundary layer

(iii) Turbulent boundary layer

(iv) Laminar sub layer

3×4 =12

Q.NO. 7(b) Explain the separation of boundary layer.

08

Q.NO. 8(a) Explain the following :

(i) Geometric similarity

(ii) kinematic similarity

(iii) Dynamic similarity

3×3 = 09

Q.NO. 8(b) Describe the following :

(i) Undistorted models

(ii) Distorted models

$$3 + 08 = 11$$

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