Section-C

Attempt **any two** questions from this section. (2×15=30)

10. a) Define the term meta- center and meta- centric height. Derive the expression for the meta- centric height of a floating body.

    b) With neat sketches, explain the conditions of equilibrium for floating and sub-merged bodies.

11. Define following terms:

    a) Capillarity

    b) Kinematic viscosity

    c) Compressibility

    d) Vapour pressure

    e) Velocity Potential Function.

12. Derive the expression for the shear stress, velocity distribution, pressure drop and head loss for viscous flow between two parallel plates.

—x—

Printed Pages : 4 | **272** | **ME-302**

(Following Paper ID and Roll No. to be filled in your Answer Book)

Paper ID : 140312 Roll No. | | | | | | | | | | |

B.Tech.

(SEM. III) THEORY EXAMINATION, 2015-16

FLUID MECHANICS

[Time : 3 hours] **[Total Marks : 100]**

Section-A

1. Attempt all sections. All sections carry **equal** marks. Write answer of each section in short. (10×2=20)

   (a) Define cavitation.

   (b) State Pascal's Law and give some examples where it is applied.

   (c) What is the importance of dimensional analysis?

   (d) List out different losses in flow through pipes.

   (e) How can we define the term flow over a half body?

   (f) Define computational fluid dynamics (CFD) and state its applications.

   (g) What is the water hammer?

(h) Define the concept of separation of boundary layer with the help of neat sketch.

(i) Give some applications based on Bernoulli's equation.

(j) Distinguish between the laminar and turbulent flow.

Section-B

Attempt **any five** questions from this section. (10×5=50)

2. If the velocity profile over a plate is a parabolic curve with the vertex 20 cm from the plate, where the velocity is 120 cm/sec. Calculate the velocity gradients and shear stresses at a distance of 0, 10 and 20 cm from the plate, if viscosity of the fluid is 8.5 poise.

3. Define the term surface tension and derive the expression for surface tecsion on liquid droplet with the help of sketch.

4. An inverted U-tube manometer is connected to two horizontal pipes A and B through which water is flowing. The vertical distance between the axis of these pipes is 30 cm. When an oil of specific gravity 0.8 is used as a gauge fluid, the vertical heights of water columns in the two limbs of the inverted manometer (when measured from the respective centre lines of the pipes) are found to be same and equal to 35 cm. Determine the difference of pressure between the pipes.

5. What do you understand by total pressure and center of pressure? Derive an expression for force exerted on a submerged inclined plane surface by the static liquid and locate the position of center of pressure.

6. Describe the governing equation of CFD. Comment on computational fluid dynamics as a design tool also discuss the advantages of CFD.

7. Determine the form of equation for the discharge Q through a sharp edged triangular notch that depends upon the notch head H, acceleration due to gravity g, Central angle α and velocity of approach V.

8. (a) A 300 mm diamter pipe carries water under a head of 20 m with a velocity of 3.5m/s if the axis of the pipe turns through 45°; find the magnitude and direction of the resultant force at the bend.

   (b) If for a 2-D 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.

9. Define the laminar boundary layer, turbulent boundary layer, laminar sub-layer, boundary layer thicknes & displacement thickness.