D 20613 (Pages : 2) Name.....

Reg. No.....

THIRD SEMESTER B. TECH. (ENGINEERING) DEGREE EXAMINATION, OCTOBER 2011

AN/ME/AM 09 303/PTME 09 302 – FLUID MECHANICS

(2009 Admissions)

Time : Three Hours Maximum : 70 marks

Part A

1. Define Newton's law of viscosity.
2. An oil of specific gravity 0.8 is in a vessel. The height of oil is 30 m. Find the corresponding height of water at the point?
3. What are the assumptions made in the derivation of Bernoullis's equation.
4. Differentiate laminar and turbulent flow.
5. What is laminar sub layer in boundary layer concept?

(5 × 2 = 10 marks)

Part B

6. What are the gauge pressure and absolute pressure at a point 4 m below the free surface of a liquid of specific gravity 1.40, if atmospheric pressure is equivalent to 750 mm of mercury.
7. Derive the discharge equation for a rectangular notch or weir.
8. Find the loss of head when a pipe of diameter 200 mm is suddenly enlarged to a diameter of 400 mm. The rate of flow of water through the pipe is 200 lit/sec.
9. What is the need of graphical description of flow pattern? Explain any *one* of the flow pattern.
10. Find energy thickness when the flow over a plate?
11. Explain about rotational and irrotational flow with an example.

(4 × 5 = 20 marks)

Part C

12. (a) An inverted U-tube differential manometer connects two pressure pipes A and B. Pipe A contains carbon tetrachloride having a specific gravity 1.5 under a pressure of 11.0 N/cm^2 and Pipe B contain oil of specific gravity 0.8 under a pressure of 11.0 N/cm^2. The pipe A lies 2.5 m below pipe B. Find the difference of pressure measured by mercury as fluid filling inverted U-tube.

Or

(b) A solid cylinder of diameter 5.0 m has a height of 4 m. Find the meta-centric height of the cylinder when it is floating in water with its axis vertical. The specific gravity of the cylinder = 0.6.

13. (a) Find the Bernoulli's equation for dynamics of fluid flow? Also obtain Bernoulli's equation for real fluid.

Or

(b) An external cylinderical mouthpiece of diameter 100 mm is discharging water under a constant head of 6 m. Determine the discharge and absolute pressure head of water at vena-contracta. Take C_d = 0.8 and C_c for vena-contracta = 0.6. Atmospheric pressure head = 10.4 m of water.

14. (a) Derive an equation to find the loss of head or energy in pipes due to friction.

Or

(b) For turbulent flow in a pipe of diameter 300 mm, find the discharge when the centre line velocity is 2.0 m/s and the velocity at a point 150 mm from the centre as measured by pitot-tube is 1.5 m/sec.

15. (a) For the velocity profile in laminar boundary layer is given as :

$u/U = 3/2\ (Y/\delta) - 1/2\ (Y/\delta)$ where u = velocity in boundary layer at a distance y

U = Free stream Velocity.

δ = Boundary layer thickness

Find the thickness of the boundary layer and shear stress 1.8 m from the leading edge of a plate. The plate is 2.5 m long and 1.5 m wide and is placed in water and which is moving with a velocity of 12 cm per second. Find the drag on one side of the plate. Viscosity of water = 0.01 poise.

Or

(b) (i) What is boundary layer separation?

(ii) Obtain Von Karman momentum integral equation.

(3 + 7 = 10 marks)

[4 × 10 = 40 marks]