ET-201(A)

B.Tech. Civil (Construction Management) / B.Tech. Civil (Water Resources Engineering) / B.Tech. (Aerospace Engineering)

Term-End Examination

June, 2016

01500

ET-201(A) : MECHANICS OF FLUIDS

Time : 3 hours   *Maximum Marks : 70*

Note : *Attempt any **seven** questions. Assume any missing data. Use of non-programmable calculator is permitted.*

1. (a) Define the following :   5

    (i)   Density

    (ii) Water Hammer

    (iii) Kinematic Viscosity

    (iv) Surface Tension

    (v)   Cavitation

    (b) What is fluid static ? Explain the working of a manometer with a suitable diagram.   5

2. (a) A cube of side 'a' and relative density 's' floats in water. Determine the condition for its stability against angular tilt.   5

(b) Explain the following :   5
    (i) Steady and Unsteady flow
    (ii) Velocity potential and Stream function

3. What do you understand by continuity equation ? Derive the continuity equation for steady and compressible fluid flow.   3+7

4. (a) What is dimensional homogeneity ? Explain the significance of the π-theorem.   5

  (b) Derive the Euler's equation for incompressible fluid flow.   5

5. (a) Explain the application of momentum equations with case of force exerted on a pipe-bend.   5

  (b) A jet travelling 450 km/hr through still air, $\gamma = 10$ N/m^3, discharges 1000 m^3/s through its two propellers of 2·25 m diameter each. Determine (i) the theoretical efficiency, and (ii) the thrust.   5

6. (a) Define the following :   5
    (i) Suppressed notch
    (ii) Contracted weirs

  (b) Derive the equation of rate of flow for a triangular notch.   5

7. Derive the Navier-Stokes equation of motion. *10*

8. (a) What are eddy viscosity and mixing length concepts ? *5*

(b) Explain the development of boundary layer concept over flat plate with a suitable diagram. Also derive the relation for momentum thickness. *5*

9. Define the following : *10×1=10*

(a) Boundary layer

(b) Boundary layer thickness

(c) Viscous layer

(d) Laminar sub-layer

(e) Drag

(f) Momentum thickness

(g) Drag coefficient

(h) Velocity distribution

(i) Reynolds number

(j) Rough and smooth boundary

10. (a) An aeroplane weighing 22000 Newtons has a wing area of 22 m^2 and a span of 10 m. What is the lift coefficient, if it travels at a speed of 300 km/hr in the horizontal direction ? Also calculate the theoretical value of circulation and angle of attack. *5*

(b) What is magnus effect ? Also define the shape of airfoil. *5*