Registration No. :

Total number of printed pages – 2

## Third Semester Back Examination – 2014
## FLUID MECHANICS AND MACHINES
## BRANCH (S) : BIOTECH, ENV, PLASTIC
### QUESTION CODE : L 324

Full Marks – 70

Time : 3 Hours

*Answer Question No. **1** which is compulsory and any **five** from the rest.*
*The figures in the right-hand margin indicate marks.*

1.  Answer the following questions :                                      2×10
    (a)  State Newton's law of viscosity.
    (b)  Explain capillary effect.
    (c)  Write the expression of pressure inside a water droplets and a soap bubble.
    (d)  Differentiate between Newtonian fluid and non-Newtonian fluid.
    (e)  What is uniform flow ? How it differs from a steady flow ?
    (f)  What do you mean by manometric efficiency and mechanical efficiency of centrifugal pump ?
    (g)  Define coefficient of discharge and coefficient of velocity.
    (h)  Differentiate turbine on the basis of head. Give example.
    (i)  Define Surface tension of fluid.
    (j)  How the velocity point is determined by pitot-tube ?

2   (a)  Classify the fluids on the basis of viscosity.                    5
    (b)  Calculate the capillarity effect in a glass tube of 6mm diameter, when immersed in a
         (i)   water and
         (ii)  mercury.
         The temperature of the liquid is 30°C and the value of surface tension of water and mercury at 30°C in contact with air are 0.0735 N/m and 0.70 N/m respectively. The contact angle for water and mercury are 0°C and 120°C respectively.                                              5

P.T.O.

3. An inward flow reaction turbine runs at 475 rpm, the head being 75mm, the inlet diameter is 100 cm, the flow area is 0.4 m², at the inlet the blade angle is 60°C. Assuming radial exit, determining 10
    (i) the volume of rate
    (ii) the power developed
    (iii) hydrolic efficiency
    (iv) specific speed.

4. (a) Explain the major losses and efficiency of centrifugal pump. 5
    (b) A single-stage centrifugal pump impeller diameter of 20cm rotate at 2000 rpm and lifts 3m³ of water per second to a height of 20 m with an efficiency of 75%. Find the number of stages required and diameter of each impeller of similar multistage pump to lift 5m³ of water per second to height of 300 m when rotating at 1500 rpm. 5

5. (a) Derive an expression for total pressure and centre of pressure point on an inclined submerged surface. 5
    (b) A rectangular surface 4m (width) × 5m (height) lies in a vertical plane. Determine force and centre of pressure on the plate when its upper edge is 9 m below the water surface. 5

6. (a) What is reciprocating pump ? Describe the principle and working of reciprocating pump with neat sketch. 5
    (b) A single acting reciprocating pump running at 50 rpm, delivers 0.01 m³/sec of water. The diameter of the piston is 300 mm and stroke length is 400 mm. determine 5
    (i) Theoretical discharge of the pump
    (ii) Slip and the % of slip of the pump

7. (a) Derive the Bernoulli's energy equation from Euler's motion equation. Mention the assumption made in the derivation. 5
    (b) A 20 cm × 10 cm venturimeter is inserted in a vertical pipe carrying oil of specific gravity is 0.8 the flow of oil is upward direction. The difference of levels between the throat and inlet section is 30 cm. the oil mercury differential manometer gives a reading of 30 cm of mercury. Calculate the discharge of oil. Neglecting losses. 5

8. Write short notes on any **two** of the following : 5×2
    (a) Vapour presser and cavitations
    (b) Manometer
    (c) Positive displacement pump
    (d) Hydrolic pump.