BACHELOR OF CIVIL ENGINEERING EXAMINATION 2019

(2ND YEAR 1ST SEMESTER)

Subject : FLUID MECHANICS II

Time: Three Hours   Full Marks :100

Answer any FIVE questions

1. a) Derive an expression for the discharge through an orificemeter.   10

    b) A 10 cm diameter of orifice discharges 45 litres/s of water under a head of 2.75 m. A flat plate held normal to the jet just downstream from the venacontracta requires a force of 31.2 kg (310 N) to resist the impact of jet. Find C_c , C_v and C_d 10

2. a) Obtain an expression for the discharge over a V-notch   10

    b) When water flows through a right angled V notch, show that the discharge is given by $Q = K H^{5/2}$ in which K is a constant and H is the height of the surface of water above the bottom of the notch. If H is measured in cm and Q in litres/s and the coefficient of discharge is 0.6, what is the value of K.   10

3. a) Prove that the maximum velocity in a circular pipe for viscous flow is equal to two times the average velocity of the flow.   10

    b) An oil of viscosity 0.1 Ns/m^2 and density 800 kg/m^3 is flowing through a circular pipe of diameter 50 mm and length 200 m. The rate of flow of fluid through pipe is 4 litres/s. Find the pressure drop in a length of 200 m and shear stress at the pipe wall.   10

4. a) Derive the expression for head loss due to sudden enlargement in a pipeline.   10

    b) The rate of flow of water through a horizontal pipe is 0.2 m3/s. The diameter of the pipe which is 200 mm is suddenly enlarged to 400 mm. The pressure intensity in the smaller pipe is 10 N/cm2. Calculate the head loss due to sudden enlargement, pressure intensity in the large pie and power lost due to enlargement.   10

5. a) Show that for minimum specific energy and maximum discharge for a rectangular open channel flow E = 1.5 y_c where y_c is the critical depth. **10**

   b) Find the diameter of a circular sewer pipe which is laid at a slope of 1 in 8000 and carries a discharge of 800 litres/s when flowing half full. Take the value of Manning's N =0.020. **10**

6. a) Show that for maximum wheel efficiency of a Pelton Wheel the speed ratio is 0.5. **10**

   b) A Pelton wheel having tangential velocity 50 m/s operates under a net head of 700 m. Bucket deflects at 165° and discharges 120 liter per second. Determine power developed and hydraulic efficiency by the turbine if coefficient of velocity is 0.98. Draw velocity triangles. **10**

7. a) Deduce the expression for the Euler Head developed by a Centrifugal Pump. **10**

   b) A centrifugal pump lifts water against a static head of 32.067 m of which 3.054 m is suction lift. The suction end delivery pipes are both 12.7 cm in diameter. The loss of head in suction is 1.07 m of water and in delivery pipe is 5.955 m of water. The impeller is 30.54 cm in diameter and 2.54 cm wide at the outer diameter. It revolves at 1450 r.p.m. and the blade angle at exit is 35°. The manometric efficiency of the pump is 80 % and the overall efficiency is 68% . Determine i) the discharge of the pump ,ii) the horse power required to drive the pump. **10**

8. Write short notes on the following: any FOUR   4 X 5 = 20
   a) Pitot tube
   b) venturimeter
   d) Pelton wheel
   e) Specific energy curve
   f) Optimum cross-section in rectangular open channel
   g) Draft tube