

**B.E. CIVIL ENGINEERING (PART TIME) FIRST YEAR FIRST SEMESTER (Old) - 2018****HYDRAULICS**

Time: Three hours

(Answer any FIVE questions)

Marks: 100

*Different parts of the same question should be answered together. All symbols carry their usual meanings unless otherwise mentioned. Assume any relevant data if necessary.*

1. a) What are the different devices used for water flow measurement? 4  
 b) Derive an expression for the discharge through a V-notch. 8  
 c) A Venturimeter of diameter (30 cm x 15 cm) is installed in pipe through which a fluid of sp. gravity is 0.9 is flowing. Determine the head of mercury differential manometer when the discharge through the pipe is 150 liter per second. Co-efficient of discharge of the meter is 0.96. 8
  
2. a) Derive the expression for the velocity profile of a viscous fluid flowing through a circular pipe. 10  
 b) A laminar flow takes place through a circular pipe of diameter 30 cm. The average velocity is 1.8m/s. Find the radius at which this occurs. Also calculate the velocity at 12 cm from the wall of the pipe. 10
  
3. a) What are the different losses in pipe flow? 5  
 b) Derive the expression for the head loss due to sudden contraction. 5  
 c) Determine the rate of flow of water through a pipe of diameter 20 cm and length 100 m when one end of the pipe is connected to a tank and other end of the pipe is open to atmosphere. The pipe is horizontal and height of water tank is 5 m above the centre of the pipe. Consider all minor losses and take  $f=0.01$ . 10
  
4. a) Prove that the head loss due to friction is equal to one-third of the total head at inlet for maximum power transmission through pipes. 10  
 b) A 80 mm diameter pipe carries water under a head of 10 m with a velocity of 6 m/s. If the axis of the pipe turns through  $45^\circ$ , calculate the magnitude and direction of the resultant force at the bend. 10

5. (a) What do you mean by open channel flow? Derive the expression for the discharge through an open channel by Chezy's formula. 10
- (b) What do you mean by most economical channel? 5
- (c) Draw specific energy curve for a steady non-uniform open channel flow? 5
6. a) Draw a schematic diagram of a Francis Turbine with its different components. 8
- b) A reaction turbine operates at 500 rpm under a head of 120 m. Its diameter at inlet is 1.2 m and the flow area is  $0.4\text{m}^2$ . The angles made by absolute and relative velocity components are  $30^\circ$  and  $60^\circ$  respectively with the tangential component. Determine the discharge and hydraulic efficiency. 12
7. Write short notes on: (any **FOUR**) 4 X 5 20
- a) Moody's Diagram
- b) Draft tube
- c) Pelton Turbine
- d) Hydraulic jump
- e) Centrifugal pump