

**BACHELOR OF ENGINEERING (CIVIL ENGINEERING) FIRST YEAR  
FIRST SEMESTER EXAM 2019 (Old)**

**Hydraulics**

Time: Three hours

**Marks: 100**

*(Answer any **FIVE** questions)*

***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 flow measurement devices are used in pipe flow and open channel flow? Discuss briefly. 10  
 b) A fluid of specific gravity 0.75 is flowing through a horizontal Venturi meter of inlet pipe and throat diameters are 35 cm and 15 cm respectively. The pressure intensity at inlet is 15 N/cm<sup>2</sup> while the vacuum pressure at the throat is 30 cm of Hg. Determine coefficient of discharge and rate of flow if co-efficient of discharge is 0.98. 10
  
2. a) Derive an expression for velocity profile in a viscous flow through pipe. 10  
 b) An oil of viscosity of 1 poise and density 800 kg/m<sup>3</sup> is flowing through a circular pipe of diameter 50 mm and length 200 m. The rate of flow of fluid through pipe is 5 litres/s. Find the pressure drop in a length of 200 m and shear stress at the pipe wall. 10
  
3. a) What are the different losses in pipes? Explain briefly. 10  
 b) The rate of flow of water through a horizontal pipe of diameter 20cm which is suddenly enlarged to 40cm diameter. If the pressure in the smaller pipe is 12N/cm<sup>2</sup> and discharge is 0.5 m<sup>3</sup>/s, calculate the head loss due to sudden enlargement and pressure in the large pipe. 10
  
4. a) What do you mean by open channel flow? 3  
 b) What is the condition for the rectangular channel to have most economic channel? 6  
 c) Derive the expression for the discharge through an open channel (Chezy's formula). 6  
 d) What is specific energy and specific energy curve? 5

5. a) Draw a schematic diagram of a hydro-electric power plant showing its major components. 8
- b) A Pelton wheel having tangential velocity 50 m/s operates under a net head of 600 m. Bucket deflects at  $165^\circ$  and discharges 130 liter per second. Determine power developed and hydraulic efficiency by the turbine if coefficient of velocity is 0.98. 12  
Draw velocity triangles.
6. a) Explain the working principle of a centrifugal pump with a neat sketch. 6
- b) What is manometric head? How do you obtain it? 4
- c) The outer and inner diameters of the impeller of a centrifugal pump are 40cm and 20cm respectively and are bent back at  $40^\circ$  to the tangent at exit. Pump delivers a discharge of  $0.12\text{m}^3/\text{s}$  of water against a head of 10m at a speed of 500rpm. If the flow area of the pump remains constant from inlet to the outlet, determine the manometric efficiency and vane angle at inlet. Draw the velocity triangle. 10
7. Write short notes on: (any **FOUR**) 4 X 5 20
- a) Moody's diagram.
- b) Draft Tube
- c) Hydraulic Jump
- d) Pitot tube
- e) Specific speed of pump
-