# BACHELOR OF CIVIL ENGINEERING EXAMINATION 2017
**(2nd Year 1st Semester Supplementary)**

## FLUID MECHANICS II

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) Derive an expression for the discharge through an Orifice meter. 8
   b) A horizontal venturimeter with inlet diameter 20 cm and throat diameter 10 cm is used to measure flow of oil of sp. gr. 0.7. The discharge of oil through venturimeter is 50 litres per second. Find the reading of the oil-mercury differential manometer. (assume $C_d$=0.98) 8
   c) What is pitot tube and pitot static tube. 4
2. a) Derive an expression for the velocity distribution for viscous flow through a circular pipe. 10
   b) A fluid of viscosity 1 poise and density 1100 kg/m$^3$ is flowing through a circular pipe of diameter 50 mm. The maximum stress at the pipe wall is given as 150N/m$^2$, determine (i) pressure gradient, ii) the average velocity and iii) Reynolds Number of the flow. 10
3. a) What are the different losses in pipe flow? 4
   b) Derive the expression for the head loss due to sudden enlargement. 8
   c) A 300 mm diameter pipe reduces in diameter abruptly to 100 mm diameter. Calculate the pressure loss across the contraction if flow through the pipe is 50 litres/s. Assume co-efficient of contraction as 0.8. 8
4. a) Find an expression for the power transmission through pipes. What is the condition for maximum transmission of power and corresponding efficiency of transmission? 10
   b) 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

5. a) How water turbines are classified? Draw a schematic of different components of a Pelton wheel. 10

b) A Francis turbine rotates at 300 rpm under a head of 50m. Its diameter at inlet is 1.2m and the flow area is $0.6m^2$. The angles made by the absolute and relative velocities at inlet are $20^0$ and $30^0$ respectively with the tangential velocities. Calculate the discharge, the power developed and hydraulic efficiency. (Assume radial flow at outlet). 10

6. a) Discuss the main components of a centrifugal pump with suitable diagram. 6

b) A centrifugal pump delivers water against a net head of 16 meters at a speed of 1000 rpm. Vane angle at outlet is 30°. Impeller diameter is 300mm and outlet width 50mm. Manometric efficiency of the pump is 90%. Determine the discharge of the pump. 8

c) Derive the expression for the specific speed of a turbine. 6

7. a) What do you mean by open channel flow? Derive the Chezy's formula for open channel flow. 10

b) What is hydraulic jump? Establish the relation between pre and post hydraulic jump (DEPTHS). 10

8. Write short notes on: (any **FOUR**) 4 X 5 20

a) Moody's Diagram

b) Equivalent pipe

c) Draft tube

d) Governing of Pelton Turbine

e) Francis Turbine