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

Fluid Mechanics II

Time: Three hours   (*Answer any FIVE questions*)   Marks: 100

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

1. a) Derive an expression for the discharge over a triangular notch.   8

   b) An orifice of 15 cm diameter is installed in pipe of 30 cm of diameter through which an oil of SG 0.9 is flowing. The pressure difference measured using a differential 8 mercury manometer is 60 cm. Calculate the discharge when the co-efficient of discharge of the meter is 0.66. Assume C_c as 0.9.

   c) Compare between notch and weir.   4

2. a) Derive the expression for the velocity profile of a viscous fluid flowing through a 12 circular pipe.

   b) An oil of sp. Gr. 0.9 and viscosity 0.06 poise is flowing through a pipe of diameter 200 mm at the rate of 60 litres/s. Find the head lost due to friction for a 500 m length of 8 pipe. Find the power required to maintain this flow.

3. a) Explain the different losses in pipe flow?   6

   b) Derive the expression for the head loss due to sudden enlargement.   8

   c) A 300 mm diameter pipe reduces in diameter abruptly to 120 mm diameter. Calculate the head loss across the contraction if the discharge through the pipe is 50 litres/s. Assume co-efficient of contraction as 0.7.   6

4. a) What do you mean by open channel flow? Derive the expression for the discharge 8 through an open channel by Chezy's formula.

   b) What do you mean by most economic channel?   4

   c) Find the bed slope of trapezoidal channel of bed width 4m, depth of water 3m and side slope of 2 horizontal to 3 vertical, when the discharge through the channel is 20 m³/s. 8 Take Manning's N = 0.03 in Manning's formula C = ($m^{1/6}$/N).

5. a) How water turbines are classified? Give examples.   6

    b) Draw a schematic a Francis turbine its major components.   6

    c) A Pelton wheel of mean bucket diameter 1 m is running at a speed of 1000 rpm under
       a head of 600 m. Determine the power developed and hydraulic efficiency of the   8
       wheel when discharge is 150 litters per second. Bucket deflects at 165 Degree.

6. a) Draw a schematic diagram of a centrifugal pump with its major components.   6

    b) What is specific speed of a pump? Derive the expression for the specific speed of a 6
       pump.

    c) A centrifugal pump delivers water against a net head of 12 metres and a design speed 8
       of 1000 RPM. The vanes are curved back to an angle of 30^0 with the periphery. The
       impeller diameter is 300 mm and outlet width 50 mm. Determine the discharge of the
       pump if manometric efficiency is 90 %.

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

    a) Pitot tube

    b) Moody's diagram

    c) Kaplan turbine

    d) Draft tube

    e) Hydraulic jump