

**BACHELOR OF ENGINEERING (CIVIL ENGINEERING)
FIRST YEAR FIRST SEMESTER EXAM 2025**

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) What is notch and weirs? 4
 b) Derive the expression of discharge for a triangular notch. 6
 c) A horizontal venturimeter with inlet diameter 20 cm and throat diameter 10 cm is used to measure flow of oil of sp. gr. 0.9. The discharge of oil through venturimeter is 60 litres per second. Find the reading of the oil-mercury differential manometer if C_d is 0.96. Draw the figure of the manometer and venturimeter. 10

2. a) Derive the expression of velocity profile through a circular pipe for viscous flow and show it. 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 10 cm and length 100 m. The rate of flow of fluid through pipe is 10 litres/s. Find the pressure drop in a length of 100 m and shear stress at the pipe wall. 10

3. a) What are the different losses in pipe flow? 4
 b) Derive the expression for head loss due to sudden enlargement in a pipe flow. 10
 c) 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. 6

4. a) Derive the Chezy's equation for open channel flow stating the assumptions. 6
 b) What do you mean by most economical section of a channel? What are the conditions of it for rectangular channel? 6
 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 $30 \text{ m}^3/\text{s}$. Take Manning's $N = 0.02$ in Manning's formula C. 8

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5. a) How water turbines are classified with suitable examples. 6
- b) A reaction turbine works at 600rpm under a head of 100m. The diameters at inlet is 1m and flow area is 0.35m^2 . The angles made by absolute and relative velocities at inlet are 15° and 60° respectively with tangential velocity. Assuming radially out, determine discharge and hydraulic efficiency. 10
- c) What is draft tube? 4
6. a) Discuss the working principle of a centrifugal pump with suitable diagram. 7
- b) A centrifugal pump delivers water against a net head of 18 metres and a design speed of 1000 rpm. The vanes are curved back to an angle of 30° with the periphery. The impeller diameter is 30 cm and outlet width 6 cm. Determine the discharge of the pump if manometric efficiency is 90 %. 8
- c) What is specific speed of pump? Derive it. 5
7. Write short notes on: (any **FOUR**) 4 X 5 20
 - a) Orifice meter
 - b) Equivalent pipe
 - c) Specific energy curve
 - d) Pelton wheel
 - e) Hydraulic jump