

Code No: RT22034

R13

SET - 1

II B. Tech II Semester Supplementary Examinations, Nov/Dec - 2016

FLUID MECHANICS AND HYDRAULIC MACHINERY

(Com. to ME, AME)

Time: 3 hours

Max. Marks: 70

- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**
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PART-A

1. a) Define the terms surface tension and capillarity.
b) What is flow-net? Is the flow-net analysis applicable to rotational flow? If not, why?
c) What is a boundary layer? Why does it increase with distance from the upstream edge?
d) How are the model testing of the centrifugal pumps carried out?
e) Explain the concept of water hammer. (4M+4M+5M+5M+4M)

PART-B

2. a) Briefly explain the conditions for stability of a floating body and submerged body.
b) A mercury column is used to measure the atmospheric pressure. The height of column above the mercury well surface is 762 mm. The tube is 3 mm in dia. The contact angle is 140° . Determine the true pressure in mm of mercury if surface tension is 0.51 N/m. The space above the column may be considered as vacuum. (6M+10M)
3. a) Derive the equation of continuity in differential form.
b) The rate of flow of water through a horizontal pipe is $0.3 \text{ m}^3/\text{sec}$. The diameter of the pipe is suddenly enlarged from 25 cm to 50 cm. The pressure intensity in the smaller pipe is 1.4 kgf/cm^2 . Determine loss of head due to sudden enlargement, pressure intensity in the large pipe and power lost due to enlargement. (8M+8M)

4. a) Define energy thickness. Derive an expression for the energy thickness.
b) Water is flowing over a thin smooth plate of length 5m and width 2.7m at a velocity of 1.2 m/sec. If the boundary layer flow changes from laminar to turbulent at a Reynolds number 5×10^5 . Find:
i) The distance from leading edge up to which boundary layer is laminar and
ii) Thickness of the boundary layer at the transition point. (8M+8M)
5. a) Derive the expression for work done and efficiency of jet striking centrally on a moving curved vane. Also find the condition for maximum efficiency.
b) A 75 mm diameter jet having a velocity of 30 m/s strikes a flat plate, the normal of which is inclined at 45° to the axis of the jet. Find the normal pressure on the plate,
i) When the plate is stationary
ii) When the plate is moving with a velocity of 15 m/s in the direction of the jet, away from the jet. Also determine the power and efficiency of the jet when the plate is moving. (6M+10M)
6. a) What is manometric efficiency of a centrifugal pump? Define with the help of a sketch. Differentiate it from volumetric efficiency and mechanical efficiency.
b) A single acting reciprocating pump has a plunger of diameter 0.3m and stroke of length 0.4m. If the speed of the pump is 60 rpm and coefficient of discharge is 0.97, determine the percentage slip and actual discharge of the pump. (8M+8M)
7. a) An Impulse turbine has to maintain the same efficiency under different working conditions. By what percentage shall the discharge increase if the head changes from 50 m to 75 m.
b) Explain the working, advantages, limitations and applications of oscillators. (6M+10M)
