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APR-MAY

B. E. (Third Semester) Examination, 2020

(Old Scheme)

(Mech., Mechatronics Engg. Branch)

FLUID MECHANICS

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : Part (a) is compulsory from each unit and carrying 2 marks. Solve any two parts from (b), (c) and (d) carrying 7 marks each.

Unit-I

1. (a) What do you mean by Mass Density? 2

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- (b) A pipe line which is 4 m in diameter contains a gate valve. The pressure at the center of the pipe is 19.6 N/cm². If the pipe is filled with oil of sp. gravity 0.87, find the force exerted by the oil upon the gate and position of center of pressure. 7
- (c) Define the following fluid properties and what are their units in SI system : 7
- (i) Compressibility
(ii) Vapour pressure
(iii) Weight density
- (d) The pressure at the centre of a pipeline of diameter 4 meter is 19.6 N/cm² which contains a gate valve. If the pipe line is filled with oil of specific gravity 0.87, find the force exerted by the oil on the gate and the position of centre of a pressure. 7

Unit-II

2. (a) Explain the term "stream line". 2
- (b) For the flow represented by, $u = x^2 - y^2$ and $v = -2xy$, determine the stream function and potential function. 7

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- (c) Define the equation of continuity. Obtain the expression for continuity equation for a three dimensional flow. 7
- (d) Distinguish between : 7
- (i) Steady flow and unsteady flow
(ii) Uniform flow and non-uniform flow

Unit-III

3. (a) State the "Bernoulli's equation" and explain it. 2
- (b) Write down the Euler's equation of motion. Derive the Bernoulli's equation from Euler's equation of motion while mentioning the assumptions made. 7
- (c) Define Venturimeter. Derive an expression for discharge through venturimeter. 7
- (d) A liquid with specific gravity 0.8 flows at the rate of 3 liter/sec through a venturimeter of diameters 6 cm and 4 cm. if the manometer fluid is mercury, determine the value of manometer reading 'h'. 7

Unit-IV

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4. (a) Differentiate between laminar flow, transition flow and turbulent flow. 2
- (b) Explain with the help diagram the “Reynolds Experiment”, and differentiate between the laminar, transient and turbulent zones. 7
- (c) Derive the Darcy-Weisbach equation for the loss of head due to the friction in pipes. 7
- (d) A crude oil of kinematic viscosity 0.4 stokes is flowing through a pipe of diameter 300 mm at a rate of 300 liters/sec. Find the head loss due to the friction for a length of 50 meter of pipeline. 7

Unit-V

5. (a) What do you mean by Dimensionless number? 2
- (b) Give explanation for the “Model analysis” while defining the “Fundamental units and Derived units”. 7
- (c) Discuss about the “Rayleigh’s and Buckingham’s π ” method used in the dimensionals analysis. 7
- (d) Define and explain “Reynold’s number” and “Euler’s number”. 7