

R16

Code No: 133AV

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech II Year I Semester Examinations, April/May - 2018

FLUID MECHANICS - I

(Common to CE, CEE)

Time: 3 Hours

Max. Marks: 75

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit.

Each question carries 10 marks and may have a, b, c as sub questions.

PART-A

(25 Marks)

- 1.a) Differentiate between atmospheric pressure and gauge pressure. [2]
- b) Explain the terms- intensity of pressure and pressure head. [3]
- c) Explain the terms: Metacentre and metacentric height. [2]
- d) Write short notes on rotational and irrotational flows. [3]
- e) What are the applications of momentum equation? [2]
- f) Define the terms forced vortex and free vortex flow. [3]
- g) What do you understand by total energy line, hydraulic gradient line? [2]
- h) Explain the terms Pipes in parallel and series. [3]
- i) Explain the concept of boundary layer. [2]
- j) How is the flow in boundary layer controlled? [3]

PART-B

(50 Marks)

- 2.a) Briefly explain the principle employed in the manometers used for the measurement of pressure.
- b) State the advantages of mechanical pressure gauges over the manometers. [5+5]

OR

- 3.a) Describe with the help of neat sketches, different types of manometers.
- b) A vertical gap 2.2 cm wide of infinite extent contains a fluid of viscosity 2.0 N s/m^2 and specific gravity 0.9. A metallic plate $1.2\text{m} \times 1.2\text{m} \times 0.2 \text{ cm}$ is to be lifted up with a constant velocity of 0.15 m/sec, through this gap. If the plate is in the middle of the gap, find the force required. The weight of the plate is 40N. [5+5]

- 4.a) Describe briefly the experimental method of determination of the metacentric height of a floating object.

- b) What is a flow net? What are its uses? Give examples. [5+5]

OR

- 5.a) Velocity potential of a certain flow field is given as: $\phi = 4xy$. Check whether the stream function exists or not? If exists, obtain an expression for stream function for the flow. Sketch the streamline of the flow.

- b) Explain the following terms in brief: i) Circulation ii) Vorticity. [5+5]

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- 6.a) Derive Bernoulli's equation from Euler's equation of motion.
b) During an experiment in a laboratory, 0.05m^3 of water flowing over a right-angled notch was collected in one minute. If the head of the sill is 50 mm, calculate the co-efficient of discharge of the notch. [5+5]

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- OR
- 7.a) Derive Euler's equation of motion.
b) Why is co-efficient of discharge of an orifice meter much smaller than that of venturimeter? [5+5]

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8. A pipeline 0.225 m in diameter and 1580 m long has a slope of 1 in 200 for the first 790 m and 1 in 100 for the next 790m. The pressure at the upper end of the pipeline is 107.91 kPa and at the lower end is 53.955 kPa . Taking $f=0.032$, determine the discharge through the pipe. [10]

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- OR
- 9.a) What is meant by water hammer? Obtain an expression for the rise in pressure in a thin elastic pipe of circular section in which the flow of water is stopped by sudden closure of valve.

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- b) How will you determine the loss of head due to friction in pipes by using Darcy formula? [5+5]

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10. State the assumptions under which the boundary layer equations for flow over a flat plate are valid. Explain with a neat sketch the boundary layer characteristics when a fluid is flowing over a flat plate. [10]

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- OR
11. Obtain Von-Karman momentum integral equation. [10]

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