

Code No: 115CG

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**B. Tech III Year I Semester Examinations, March - 2017****MECHANICS OF FLUIDS AND HYDRAULIC MACHINES****(Automobile Engineering)****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**5 × 5 Marks = 25**

- 1.a) Explain the physical properties fluids. [2]
- b) Determine the minimum size of glass tube that can be used to measure water level, if the capillary rise in the tube is not to exceed 0.25cm. Take surface tension of water in contact with air as 0.0075 kg/m. [3]
- c) Explain the stream, streak and path lines. [2]
- d) What is meant by one dimensional, two-dimensional, three-dimensional flows? [3]
- e) Distinguish between laminar and turbulent flow. [2]
- f) How is head loss in commercial pipes determined? [3]
- g) What is the water hammer concept and how do you avoid the water hammer problem? [2]
- h) What is meant by scroll casing and draft tube? [3]
- i) Explain with neat sketches, the working of a single stage centrifugal pump. [2]
- j) Why reciprocating pump is called positive displacement pump? [3]

PART – B**5 × 10 Marks = 50**

- 2.a) Explain the how vacuum pressure can be measured with the help of a U-tube manometer.
- b) Describe the different types of manometers with the help of neat sketches. [5+5]

OR

3. A U-tube containing mercury has its right limb open to atmosphere. The left limb is full of water and is connected to a pipe containing water under pressure, the centre of which is in level with the free surface of mercury. Find the pressure of the water in the pipe above atmosphere, if the difference of level of mercury in the limbs is 5.08cm. [10]
4. In a steady flow two points A and B are 0.5m apart on a straight streamline. If the velocity of flow varies linearly between A and B what is the acceleration at each point if the velocity at A is 2m/s and the velocity at B is 6m/s? [10]

OR

5. Derive Bernoulli's equation from fundamentals along with assumptions used in that. [10]

6. What is the compound pipe? How would you determine the equivalent size of a compound pipe? [10]

OR

- 7.a) Explain the terms hydraulic gradient and total energy line with a neat diagram.
b) Explain the concept of pipes connected in series and parallel. [5+5]

8. A model turbine has a runner of diameter 0.61m. It develops 50kW under a head of 30m at speed of 4000 r.p.m. Compute N_s and N_u for this model. It is required to build a similar turbine. To develop 155kW under a head of 36m, calculate the required diameter. [10]

OR

9. A Kaplan turbine produces 44000kW under a head of 25m with an overall efficiency of 90%. Taking the value of speed ratio K_u as 1.6, flow ratio ψ as 0.5 and the hub diameter as 0.35 times the outer diameter, find the diameter and speed of the turbine. [10]

- 10.a) Explain the function of air vessels in a reciprocating pump.
b) Discuss the condition under which cavitation and negative slip occur and state why air vessels are used in reciprocating pumps. [5+5]

OR

- 11.a) Classify centrifugal pumps.
b) Explain the working of centrifugal pump along with a neat sketch. [5+5]

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