

<b>R16</b>
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Code No: 134BC

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**B.Tech II Year II Semester Examinations, December - 2018**

**FLUID MECHANICS AND HYDRAULIC MACHINES**

(Common to ME, MSNT)

**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) Explain the difference between simple and differential manometer. [2]
- b) Derive dimensions for Bulk modulus (k) and kinematic viscosity. [3]
- c) What is continuity equation? Give the applications. [2]
- d) What are the practical applications of Bernoulli's equation? [3]
- e) Explain how laminar and turbulent boundary layers are formed. [2]
- f) What is the significance of the upper and lower critical Reynolds number? [3]
- g) What is Water hammer? [2]
- h) Explain about cavitation in turbines? [3]
- i) What is priming of a centrifugal pump? Why it is needed. [2]
- j) Define slip of reciprocating pump and under what circumstances does the negative slip will occur? [3]

**PART-B**

**(50 Marks)**

- 2.a) A Plate of a certain oil weighs 40KN. Calculate the sp. Wt., mass density and specific gravity of this oil.
- b) Find the pressure inside a water droplet of dia 0.03mm, if the surface tension of water is 0.075N/m.
- c) Find the intensity of pressure at a depth of 2m in a liquid of sp. gr. 0.8. [6+2+2]

**OR**

- 3.a) Explain how vacuum pressure can be measured with the help of a U-tube manometer.
  - b) In a mercury differential manometer the mercury deflection is 20 cm. Find the difference of pressure in 'kpa' if the liquid flowing in the pipe is oil of sp. gr. 0.8. [5+5]
4. Define and distinguish between:
- a) (i) uniform flow and non- uniform flow (ii) laminar and turbulent flow
  - b) stream lines, path lines, streak lines and stream tube [5+5]

**OR**

- 5.a) Show the stream lines and equipotential lines intersect each other orthogonally.
- b) The velocity components in a two dimensional flow field for an incompressible fluid are expressed as  $u = y^3 + 2x - x^2y$ ;  $v = xy^2 - 2y - x^3$ , show that these functions represents a possible case of an irrotational flow, [5+5]

- 6.a) Explain with sketches the three methods of boundary layer control.  
b) Two water carrying circular pipes are connected in parallel. The length  $L_1$ , diameter  $d_1$ , and friction factor  $f_1$  for the first pipe are 200m, 0.5m and 0.025m respectively, while  $L_2=100m$ ,  $d_2=1.0m$  and  $f_2=0.02$ . What is the velocity ratio  $V_2/V_1$ . [5+5]

**OR**

- 7.a) The thickness of the laminar boundary layer on a flat plate at a point A is 2cm and at a point B, 1m down stream of A, is 3cm. What is the distance of A from the leading edge in cm?  
b) Prove that the maximum velocity is twice the average velocity in laminar flow through circular pipe. [5+5]

- 8.a) Draw the velocity triangle for Pelton wheel, Francis turbine and Kaplan turbine.  
b) Sketch the different types of draft tubes? Give the formula for efficiency of it. [5+5]

**OR**

- 9.a) A Nozzle of 50mm diameter delivers a stream of water at 20m/s perpendicular to a plate that moves away from the jet at 5m/s. Find the force on the plate, the work done and the efficiency of jet.  
b) Differentiate between Impulse turbine and Reaction turbine. [6+4]

- 10.a) Derive an expression for specific speed of a centrifugal pump.  
b) The cylinder bore diameter of a single acting reciprocating pump is 150 mm and its stroke length is 300 mm. The pump runs at 50 rpm and lifts water through a height of 25m. The delivery pipe is 22 m long and 100mm in diameter. Find the theoretical discharge. If the actual discharge is 4.2 liters/s, find the % Slip. [5+5]

**OR**

- 11.a) Draw and discuss the characteristic curves of centrifugal pump.  
b) Enumerate the losses which occur when a centrifugal pump operates. [5+5]

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