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# APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
Fourth Semester B.Tech Degree (S,FE) Examination May 2024 (2015 Scheme)

**Course Code: ME200**
**Course Name: FLUID MECHANICS AND MACHINERY (ME, SF)**

Max. Marks: 100                                          Duration: 3 Hours

## PART A
### Answer any three questions. Each question carries 10 marks.

1  a)  Derive the expression for total pressure (F) and centre of pressure (h*) for an inclined plane surface submerged in liquid                                          5

   b)  A rectangular plane surface 3 m wide and 4 m deep lies in water in such a way that its plane makes an angle of $30^0$ with the free surface of water. Determine the total pressure force and position of centre of pressure, when the upper edge is 2 m below the free surface                                          5

2  Explain any *two* mechanical pressure gauges with neat sketch.                                          10

3  Explain: Newton's law of viscosity. Explain the variation of viscosity with temperature for                                          2

   a)  Liquids                                          4

   b)  Gas                                          4

4  a)  Calculate the capillary effect in millimetres in a glass tube of 4 mm diameter, when immersed in (i) water and (ii) mercury. The temperature of the liquid is $20^0C$ and the values of surface tension of water and mercury at $20^0C$ in contact with air are                                          5

   0.073575 N/m and 0.51 N/m respectively. The angle of contact for water is zero and that for mercury is $130^0$. Take the density of water at $20^0C$ as equal to 998 $kg/m^3$.

   b)  Determine the viscosity of a liquid having kinematic viscosity of 6 stokes and specific gravity 1.9.                                          5

## PART B
### Answer any three questions. Each question carries 10 marks

5  State Bernoulli's theorem. Derive and expression for Bernoulli's equation from Newton's law and state the assumptions made for such a derivation.                                          10

6  a)  With the help of a neat sketch, explain Reynolds's experiment.                                          6

    b)   Explain the significance of Reynolds's number.              4

7   a)   A 30 cm x 15 cm venturimeter is inserted in a vertical pipe carrying water, flowing in the upward direction. A differential mercury manometer connected to   6 the inlet and throat gives a reading of 20 cm. Find the discharge. Take $C_d = 0.98$.

    b)   List the merits and demerits of orifice meter         4

8     Explain the effect of pressure gradient on boundary layer separation.     10

## PART C
### Answer any four questions. Each question carries 10 marks.

9     With the help of neat sketches, explain the construction and working of a Pelton   10 Wheel

10     A jet of water of diameter 10 cm strikes a flat plate normally with a velocity of 15 m/s. The plate is moving with a velocity of 6 m/s in the direction of the jet and away from the jet. Find:

    a)   the force exerted by the jet on the plate         3

    b)   Work done by the jet on the plate per second       2

    c)   Power of the jet in kW          2

    d)   Efficiency of the jet          3

11   a)   With the help of neat sketches, explain draft tube and its types.     5

    b)   Explain: Draft –Tube Theory         5

12     The outer diameter of an impeller of a centrifugal pump is 400 mm and outlet width is 50 mm. The pump is running at 800 r.p.m. and is working against a total head of 15 m. The vane angle at the outlet is $40^0$ and the manometric efficiency is 75 %. Determine:

    a)   Velocity of flow at outlet         4

    b)   Velocity of water leaving the vane       2

    c)   Angle made by the absolute velocity at outlet with the direction of motion at outlet   2

    d)   Discharge          2

13   a)   Classify reciprocating pumps.         5

    b)   With neat sketch, explain the working of a reciprocating pump with its main parts   5

14     Explain the following:

    a)   Slip of a reciprocating pump         3

    b)   Air vessels and their purposes        4

    c)   Priming and its uses         3