



SECTION A

1. Select and write the correct answer for the following multiple choice type 3 of questions:

i. Bernoulli's principle is true under which of the following assumptions?

(A) The fluid is viscous and streamline.

(B) The fluid is non-viscous and streamline.

(C) The fluid is non-viscous and turbulent.

(D) The fluid is viscous and turbulent.

ii. Kirchhoff's junction law is equivalent to _____.

(A) conservation of energy

(B) conservation of charge

(C) conservation of electric potential

(D) conservation of electric flux

iii. A body is moving in a circular orbit with static friction 0.4. If radius through which the body revolves is 50 m and $g = 9.8 \text{ m/s}^2$, then maximum speed with which body revolved is

(A) 14 m/s

(B) 19 m/s

(C) 11 m/s

(D) 13 m/s

2. Answer the following questions:

3

i. Why is the surface tension of paints and lubricating oils kept low?

ii. The relative velocity between two layers of fluid, separated by 0.1 mm is 2 cm/s. Calculate the velocity gradient.

iii. Define or describe a Potentiometer.

SECTION B

Attempt any TWO questions of the following:

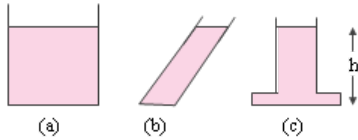
4

3. What is the pressure inside the drop of mercury of radius 3 mm at room temperature? Surface tension of mercury at temperature 20°C is 4.65×10^{-1}

N m^{-1} .

(1 atm = 1.01×10^5 Pa)

4. Why does the speed of a liquid increase and its pressure decrease when a liquid passes through constriction in a horizontal pipe?
5. On what factors does the internal resistance of a cell depend?
6. A. The figures show three containers filled with the same oil. How will the pressures at the reference line compare?



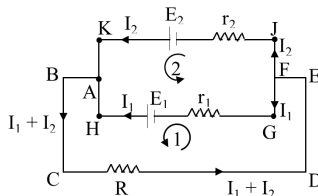
- B. On what factors does the potential gradient of the wire depend?

SECTION C

Attempt any TWO questions of the following:

6

7. State Pascal's law of fluid pressure. Describe the experimental proof for the same.
8. Two cells of emf 1.5 volt and 2 volt having respective internal resistances of 1Ω and 2Ω are connected in parallel so as to send current in same direction through an external resistance of 5Ω . Find the current through the external resistance.



9. A rigid object is rolling down an inclined plane. Derive expressions for the acceleration along the track and the speed after falling through a certain vertical distance.

SECTION D

Attempt any ONE question of the following:

4

10. Derive expression for time period of a conical pendulum.
11. A. State the applications of Wheatstone bridge.
B. A uniform solid sphere has radius 0.2 m and density $8 \times 10^3 \text{ kg/m}^3$. Find the moment of inertia about the tangent to its surface. ($\pi = 3.142$)