Mid-West University

Examinations Management Office

Surkhet ,Nepal

Final Examinations -2079

Bachelor level/ B.Sc/ 1st Semester — Full Marks : 60

Time: 3hrs — Pass Marks.: 30

Subject : **Mechanics(PHY411/311)**

Candidates are required to give their answer in their own words as far as practicable. The figures in the margin indicate full marks.

GROUP – A

Attempt all long questions **[4x6=24]**

1. State and prove Kepler's first law in planetary motion. [1+5]
2. Define Poisson's ratio. Derive a relation connecting it with bulk modulus:

$$k = \frac{Y}{3(1-2\sigma)}$$ [6]

OR

State and Prove Bernoulli's theorem in the fluid motion.

3. What is the reason behind the rise liquid in the capillary tube? Derive the expression for the capillary rise: $T = \frac{rh\rho}{2}$, for water. [6]
4. A solid sphere of mass 100 gm and radius 2.5 cm rolls without sliding with a uniform velocity of 10 cm/sec along a straight line on a smooth horizontal table. Calculate its total energy. [6]

Group – B

Attempt all Short questions **[6X4= 24]**

5. Calculate the excess pressure inside a soap bubble of radius $3\times10^{-3}m$. Surface tension of soap solution is $20 \times10^{-3}\ Nm^{-1}$. Also calculate the surface potential energy.
6. A pitot tube is fixed to a water pipe of diameter 10 cms and the difference of pressure indicated by the gauge is 4 cm of water column. Find the volume of water flowing per second through the pipe.
7. One end of a wire, 2 mm in diameter and 50 cm in length is twisted through 0.8 radian . Calculate the shearing strain at the surface of the sphere.
8. The position of a moving particle is at any instant given by r=A cosθ $\hat{\imath}$ + A sinθ $\hat{\jmath}$. Show that force acting on it is conservative one.
9. A particle follows a spiral orbit given by r= $aexp(b\theta)$ where a and b are constants. Obtain the force law.
10. State and prove the theorem of parallel axis in a rigid body.

OR

Derive a relation of velocity in plane polar coordinate system.

Group – C

Attempt all Very Short questions **[6X2= 12]**

a. Write the transformation equations relating spherical polar coordinate and rectangular coordinate systems.
b. Give the idea of continuity equation in fluid motion with an example.
c. Give an idea about Rutherford scattering.
d. Write an idea of central force with examples.
e. Write a relation connecting electric potential and electric field with short description.
f. What do you know about bending moment?
g. In a wind storm, some of the roof top are blown off, Why?
h. Small drops of water are spherical, Why?

THE END