T.Y.B.SC. SEM – V (2014 COURSE) : WINTER - 2017

SUBJECT: PHYSICS: CLASSICAL MECHANICS

Day : **Wednesday**
Date : **01/11/2017**

Time: **03.00 PM TO 05.00 PM**
Max. Marks: 40.

W-2017-0660

N.B.:

1) All questions are **COMPULSORY.**
2) Figures to the **RIGHT** indicate full marks.
3) Draw neat labeled diagrams **WHEREVER** necessary.

Q.1 Attempt any **TWO** of the following: **(10)**

a) Show that the total angular momentum of a system of a particles equal the sum of the angular momentum of its centre of mass about origin and angular momentum of the system about its centre of mass.

b) Obtain Hamiltonian and Hamilton's equations of motion for a simple pendulum.

c) State and prove Kepler's third law of planetary motion.

Q.2 Attempt any **TWO** of the following: **(10)**

a) Show that the trajectory of a charged particle in uniform electric field is parabola.

b) Comment on the equation $\mathbf{g}_{eff} = \mathbf{g} - \boldsymbol{\omega} \times (\boldsymbol{\omega} \times \mathbf{r})$, draw the necessary diagram.

c) Compare Newton's, Lagrange's and Hamilton's formulations in mechanics.

Q.3 Attempt any **TWO** of the following: **(10)**

a) Apply D' Alembert's principle to get the acceleration in Atwood's machine.

b) Show that $[d\mathbf{r}/dt]_f = [d\mathbf{r}/dt]_r + \boldsymbol{\omega} \times \mathbf{r}$, where symbols have their usual meanings.

c) Derive the differential equation for the orbit in central force motion.

Q.4 Attempt any **FIVE** of the following: **(10)**

a) What is the central force field? State its characteristics.

b) State the principle of Galilean invariance.

c) Show that linear momentum and angular momentum of a free particle are constant of motion.

d) Explain the meaning of scleronomous and rhenomous constrains

e) Under what condition Corioli's forec is zero and maximum.

f) A spring is kept compressed by tying its ends tightly together. It is then placed in acid where it dissolves. What happens to its stored potential energy?

g) State and explain principle of virtual work.

* * *