T.Y.B.SC. SEM – V (2014 Course) : SUMMER - 2019
SUBJECT : CLASSICAL MECHANICS

Date : Wednesday
Date : 24/04/2019

Time : 12.00 NOON TO 02.00 PM
Max. Marks : 40.

S-2019-1011

N.B.:

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

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

a) Set up the Hamiltonian function for simple pendulum and solve it.
b) State and prove Kepler's third law of planetary motion.
c) Show that the path of charged particle moving with a uniform velocity in a transverse electric field is a parabola.

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

a) Discus the motion of a charged particle in a constant magnetic field. Hence show that path of a charged particle moving with uniform velocity in a constant magnetic field is a circle.
b) What do mean by Corioli's force in moving coordinate system, give one phenomena in nature arising due to the Corioli's force.
c) State and explain D'Alembert's principle.

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

a) Write the Lagrangian for Atwood's machine and deduce its equation of motion.
b) Show that $\left(\frac{d\bar{r}}{dt}\right)_f = \left(\frac{d\bar{r}}{dt}\right)_r + \bar{\omega}\times\bar{r}$ where symbols have their usual meanings.
c) Draw a rough graph of effective potential energy against position vector and explain quantitatively different shapes of orbits.

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

a) Explain the concept of weightlessness in a satellite.
b) Show that linear momentum and angular momentum of a free particle are constant of motion.
c) Is the Lagrangian formulation more advantageous than the Newtonian formulation? Why?
d) Estimate the centrifugal acceleration at the equator of the earth.
(Given Average radius of the earth = 6.46×10^6 m)
e) When does the Hamiltonian equal the total energy of the system?
f) State the principle of Galilean invariance.

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