C.U.SHAH UNIVERSITY
Wadhwan City

Subject Code : 5SC01PHC2   **Summer Examination-2014**   Date: 12 /06/2014

Subject Name:- **Classical Mechanics**
Branch/Semester:- M.Sc(Physics) /I   Time:10:30 To 1:00
Examination: Remedial

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Instructions:-
(1) Attempt all Questions of both sections in same answer book / Supplementary
(2) Use of Programmable calculator & any other electronic instrument is prohibited.
(3) Instructions written on main answer Book are strictly to be obeyed.
(4) Draw neat diagrams & figures (If necessary) at right places
(5) Assume suitable & Perfect data if needed
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SECTION-I

Q.1   Write answers of the following Questions

1. What is meant by Conversation of angular momentum?   2
2. Write the conditions required for circular orbit.   2
3. How the Bertrand's theorem and perturbation of orbits are useful in   2
   astronomical units?
4. Give the Formula of Eccentricity.   1

Q.2   A. Derive the Lagrange's equations from Hamilton's principle.   5
      B. Find the equation of orbit and classify different types of orbits on the   5
         basis of energy and eccentricity.
      C. Explain some techniques of the calculus of Variation.   4

OR

Q.2   A. Derive the differential equation of orbit.   5
      B. Explain Hamilton's Principle.   4
      C. Derive Variation Principle   5

Q.3   A. Write a Short note on Virial theorem.   7
      B. Discuss Bertrand's theorem with necessary mathematical expression.   7

OR

Q.3   A. Derive the Kepler's square law of force.   7
      B. Using Lagrange's equation for r, obtain the following integral 7

$$t=\int_{r_0}^{r} \frac{dr}{\sqrt{\frac{2}{m}[E-V(r)-\frac{l^2}{2mr^2}]}}$$

SECTION-II

Q.4   Write answers of the following Question.

1. What is impact parameter in scattering?   1
2. With Example explain stable and unstable equilibrium in small   1
   oscillations.
3. Differentiate Co-ordinate system and Frame of reference.   1
4. What is inertial frame of reference?   1
5. For Poisson's brackets and prove [X, X]=0.   1
6. What is the maximum centrifugal acceleration value of earth?   1
7. If the generating function is $F_2=q_i p_i$ then prove $p_i=P_i, Q_i=q_i$ and k=H   1

Q.5	A.	Show that the angular acceleration is the same in Fixed and Rotating frames.	5
	B.	Give the example of Harmonic Oscillator.	5
	C.	What is Coriolis force? Explain.	4

OR

Q.5	A.	Discuss the Eigen Vectors and Eigen Frequencies using two coupled pendulum.	5
	B.	Explain Gauge transformation.	5
	C.	What are normal co-ordinates? Explain	4

| Q.6 | A. | What is Canonical transformation? Obtain the transformation equation for generating function F_1. | 7 |
| | B. | Obtain Hamilton's characteristics function . find the relation in which the time is as a co-ordinate and Hamiltonian is its conjugate momentum. | 7 |

OR

| Q.6 | A. | Derive Hamilton-Jacobi equation and obtain its solution. | 7 |
| | B. | Explain Rutherford scattering . | 7 |

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