

Master's Degree Examination – November 2017

1 Semester

**Class : I PG
Major : Physics**

**Time: 3 hours
Max. Marks: 60**

**17MPHC02 Classical Mechanics
PART -A**

Choose the Correct Answer

10X1/2=5

1. If the constraint relations do not depend on time it is called as
a. Scleronomic b. holonomic c. bilateral d. conservative
2. Hamilton's principle is
a. $\int (T-V) dt$ b. $(T+V)$ c. constant d. 2
3. Force between two interacting particles is
a. always gravitational b. central c. always electrical fluids d. zero
4. According to Kepler's law for a conic section as a curve
a. $rd = \text{constant}$ b. $r=0$ c. r/d is a constant d. 10
5. Kinetic energy of harmonic oscillator is
a. $p^2/2$ b. p/m c. $p/2m$ d. $p^2/2m$
6. $(q_i, H) =$
a. $\partial H / \partial p_j$ b. ∂H c. ∂p_j d. zero
7. Angular momentum $L =$
a. $\sum m_i (r_i \times v_i)$ b. $(r_i \times v_i)$ c. $(r_i \times v_i)/m$ d. $2 (r_i \times v_i)$
8. A top will spin with its axis vertical continuously is called
a. axis top b. symmetric top c. sleeping Top d. rotating top
9. Generalized coordinates each one of them executing oscillations of one single frequency are called
a. normal coordinates b. normal vibrations c. rotations d. oscillating field
10. Absorption band of linear tri atomic molecule appear in which region
a. IR b. RF c. NMR d. UV

PART B
Answer ALL questions

5 x 4 = 20

Each answer should not exceed 200 words or one page

- 11a. State and prove D' Alembert's principle.
(OR)
- 11.b State and explain principle of least action.
- 12a. Discuss about reduction to equivalent one dimensional one body problem.
(OR)
- 12 b. State and prove Virial theorem.
- 13 a. Obtain solution for harmonic oscillator using Hamiltonian dynamics.
(OR)
- 13 b. Explain about action angle variables.
- 14 a. Explain about angular momentum of rigid body.
(OR)
- 14 b. Discuss about Coriolis force.
- 15 a. Write short notes on stable equilibrium and potential energy.
(OR)
- 15 b. Discuss about normal modes and normal coordinates.

Part C

Answer ALL questions

5 x 7 = 35

Each answer should not exceed 600 words or three pages

- 16a. Derive Lagrange's equation from D' Alembert's for non conservative force.
(OR)
- 16b. Deduce Hamilton's principle from D' Alembert's equation.
- 17a. Elaborate about Kepler's problem.
(OR)
- 17b. Discuss about (i) Stability and closure of orbit (ii) Scattering in a central force field
- 18a. Brief on conservation of angular momentum, linear momentum and energy.
(OR)
- 18b. Describe about Kepler's problem in action angle variate.
- 19a. Discuss about Inertia tensors and force of Coriolis.
(OR)
- 19b. Discuss about the concept of force free motion of symmetric top.
- 20a. Elaborate about two coupled oscillators.
(OR)
- 20b. Discuss about the vibrations of linear tri atomic molecules.