

**7<sup>th</sup> Semester Regular Examination 2017-18****Classical Mechanics****BRANCH : M.Sc.I(AP)****Time: 3 Hours****Max Marks: 70****Q.CODE: B639****Answer Question No.1 which is compulsory and any five from the rest.****The figures in the right hand margin indicate marks.**

- Q1 Answer the following questions : (2 x 10)**
- What do you mean by Isotropic and homogenetic space?
  - Explain what is virtual displacement and the principle of virtual work? Give example.
  - What are generalised co-ordinates? Why do you need these in dynamics? What are the generalised coordinates that describes the dynamics of particle on the surface of the sphere.
  - What is difference between  $\Delta$  -variation and  $\delta$  -variation?
  - State Hamilton's Canonical equation of motion & mention the significance of Hamiltonian. When the Hamiltonian becomes the total energy of the system?
  - State D'Alembert's Principle. What is the significance of this principle?
  - What is variational principle?
  - How many constraints are there in dynamics. Differentiate Holonomic & non-holonomic constrains?
  - What is canonical transformation? Explain the role of generating function in canonical transformation.
  - State and explain the Principle of least action.
- Q2 State and prove the conservation of linear momentum for a system of particles? Differentiate inertial and non-inertial frame of reference? (10)**
- Q3 a) Using D' Alembert's principle, derive Lagrangian equation of motion? (5)**  
**b) Given the Lagrangian  $L = \frac{1}{2} (dx/dt)^2 - (1/2) k x^2$ , find the solution of the equation obtained from it. (5)**
- Q4 Discuss the theory of small oscillation and obtain the normal coordinates and eigen frequency. (10)**
- Q5 a) Define Poisson bracket & Lagrangian bracket? Show that they are canonically invariant(invariant under canonical transformation). (5)**  
**b) Show that the phase space volume is invariant under canonical transformation. (5)**
- Q6 What is generating function? Write the four generating functions which induce canonical transformation? Derive the four canonical transformation equations using these generating functions. (10)**
- Q7 Derive Hamilton-Jacobi equation for Hamilton principal function & derive the equation of motion for Harmonic oscillator? (10)**
- Q8 Write short answer on any TWO : (5 x 2)**
- Isotropic and hmoogeneity of space and Conservation of Linear momentum and Angular Momentum.
  - Legendre Transformation.
  - Liouville's theorem.
  - Infinitesimal canonical Transformation.