Tutorial Examination'2021
Paper:DSE A2 B Time:45 Minutes

Answer *three* of the following questions(taking at
**least one from each of the two groups)**

$$3 \times 5 = 15$$

Group - A: Calculus of Variations
Answer at least one from the following.

1. The Lagrangian of a particle is given by $L = \frac{m}{2}(x^{\cdot 2} + y^{\cdot 2} + z^{\cdot 2}) - v(x, y, z)$ Calculate the Hamiltonian and Hamiltons equation of motion of the particle. Symbols have their usual meanings.

2. What is basic difference between Lagrangian and Hamiltonian formalism and what is the advantage of Hamiltonian formalism over Lagrangian formalism ?

3. Calculate poisson Bracket $[l_\alpha, q_\beta]$. Where l is the angular momentum and q is position in cartesian co-ordinate system.(Using levi-civita symbol)

Group - B: Small Oscillations and Rigid Body Motion
Answer atleast one from the following

1. Obtain the inertia tensor of a system, consisting of four identical elements of mass m each, arranged on the vertices of a square of slides of length 2a, with coordinates of four particles given by $(\pm a, \pm a, 0)$

2. Determine the V and T matrices for the following system.
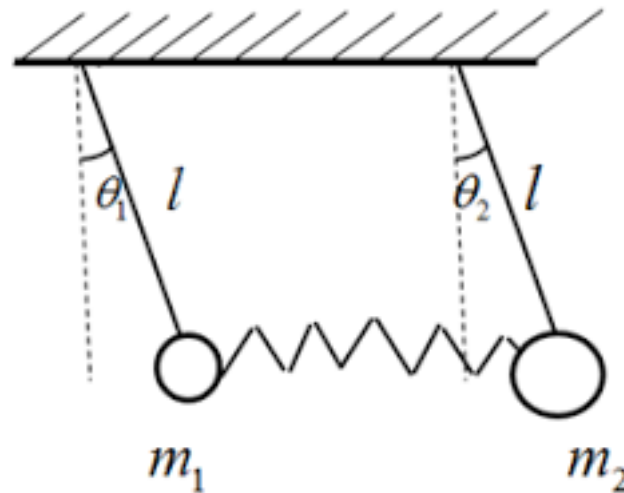
3. Find out the normal frequencies and eigen vectors of the above system (question 2)

Full Marks : 15
Answer any *three* of the following questions $3 \times 5 = 15$

1. Draw the block diagram of a mobile phone hand set. Explain the functions of each part of radio transmitter and receiver in this set. 2+3

2. Explain CDMA with an example using four stations. 5

3. Explain unipolar, polar and bipolar RZ and NRZ with an example. 5

4. What do you mean by modulation index? Explain with expression. 2+3

5. Draw the block diagram of a superheterodyne receiver.
   What do you mean by heterodyning?   3+2

6. What do you mean by sky wave communication? Derive secant law associated with this. 3+2

7. Give a comparison of 2G, 3G and 4G mobile telephony(qualitatively). 5

8. Give an outline of GPS tracking (qualitatively). 5

9. Give a simplified block diagram of either earth station of a satellite or a mobile handset 1+4