

SECTION B – K3 (CO2)**Answer any THREE of the following****(3 x 10 = 30)**

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| 3 | Derive Hamilton's principle from D'Alembert's principle. |
| 4 | Define angular momentum and derive an expression for the rotational kinetic energy in terms of angular momentum. |
| 5 | Write a brief note on Routh's procedure. |
| 6 | Justify that the Poisson bracket is invariant under canonical transformation with a suitable proof. |
| 7 | Prove that the Hamilton's principle function is given by $S = \int L dt + C$ where L is the Lagrangian. |

SECTION C – K4 (CO3)**Answer any TWO of the following****(2 x 12.5 = 25)**

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| 8 | Write a brief note on constraints and its classification in a dynamical system. |
| 9 | State and prove Euler's theorem. |
| 10 | If the component of the applied torque along the axis of rotation vanishes then prove that the component of total angular momentum along the axis of rotation is conserved. |
| 11 | Derive the Angular momentum - Poisson bracket relation. |

SECTION D – K5 (CO4)**Answer any ONE of the following****(1 x 15 = 15)**

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| 12 | State and prove the principle of least action. |
| 13 | Determine the moments of inertia of a uniform hemisphere about its axis of symmetry and about an axis lying in the base perpendicular to the symmetry axis. |

SECTION E – K6 (CO5)**Answer any ONE of the following****(1 x 20 = 20)**

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| 14 | (a) Derive the Lagrange's equation of motion for a holonomic system. (10 marks)
(b) Find the action-angle variable for Simple Harmonic Oscillator. (10 marks) |
| 15 | State and prove the different possibilities for the generating function in canonical transformation. |

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