Reg. No. \_\_\_\_\_\_\_\_\_\_\_\_\_



**End Semester Examination – Nov / Dec – 2019**

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| **Code :** | **17PH3001** | **Duration :** | **3hrs** |
| **Sub. Name :** | **CLASSICAL MECHANICS** | **Max. Marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | State and explain Hamilton’s variational principle. | CO1 | 5 |
| b. | Obtain the Lagrange’s equation of motion using D’Alembert’s principle for the conservative system. | CO1 | 15 |
| **(OR)** | | | | |
| 2. | a. | Apply Lagrange’s equation to find the motion of a simple pendulum. | CO2 | 10 |
| b. | Find the equations of motion of a coupled oscillator having two equal masses ‘m’ coupled by three springs with same force constant ‘k’ by using Lagrange’s equation. | CO2 | 10 |
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| 3. |  | Deduce the first order integrals to locate the position of the particle on the path at any time. Also obtain the differential equation of an orbit. | CO3 | 20 |
| **(OR)** | | | | |
| 4. |  | Find the central force under the action of which a particle will follow an orbit described by | CO3 | 20 |
|  |  |  |  |  |
| 5. |  | Obtain the complete transformation matrix for a transformation from one set of three dimensional coordinate system to another having the same origin using Euler’s angles. | CO4 | 20 |
| **(OR)** | | | | |
| 6. | a. | Estimate the principal axes and their associated moments of inertia for a cube of mass ‘m’ and sides ‘b’. Hence prove that the principal axes corresponding to lie along the diagonal of the cube. | CO5 | 15 |
| b. | Two masses m1 and m2 resting on a smooth surface are joined together by a spring with force constant k. Assuming that the motion remains one dimensional, find normal frequency of vibration. | CO5 | 5 |
|  |  |  |  |  |
| 7. | a. | Deduce Hamilton canonical equations from a variational principle. | CO4 | 10 |
| b. | Apply Hamiltonian to find the equation of motion of a simple pendulum. | CO6 | 10 |
| **(OR)** | | | | |
| 8. |  | Solve simple harmonic oscillator problem using canonical transformation. | CO6 | 20 |
|  | | **Compulsory**: |  |  |
| 9. |  | Illustrate Hamilton Jacobi theory by applying it to the Kepler’s problem. | CO5 | 20 |