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

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**End Semester Examination – Nov/Dec – 2017**

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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. | Describe the different types of constraints. | CO1 | 6 |
| b. | Explain the principle of virtual displacement and D’Alembert’s principle. Deduce the Lagrange’s equation of motion from D’Alembert’s principle. | CO1 | 14 |
| (OR) | | | | |
| 2. | a. | Apply Lagrange’s equation of motion to a simple pendulum and deduce the equation of motion. | CO4 | 8 |
| b. | Find the equations of motion of a coupled oscillator having two different masses coupled by three springs with different force constant by using Lagrange’s equation. | CO4 | 12 |
|  |  |  |  |  |
| 3. | a. | Express the Lagrange’s equation of a particle in the plane polar co-ordinates r and θ. Given that | CO2 | 15 |
|  | b. | Define Kepler’s first and second law of planetary motion. | CO2 | 5 |
| (OR) | | | | |
| 4. | a. | Investigate the motion of particle moving under an attractive inverse square law using the differential equation of the orbit in polar coordinates under a central force. | CO3 | 15 |
|  | b. | A particle describes the circular orbit given by r = 2a cos θ. Show that the force varies as the inverse fifth power of the distance. | CO4 | 5 |
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| 5 | a. | State Euler’s Theorem. | CO5 | 3 |
|  | b. | Derive Euler’s angle which is used to specify the orientation of rigid body with neat sketch. | CO5 | 17 |
| (OR) | | | | |
| 6. |  | Deduce the normal co-ordinates and normal frequencies of vibration of a linear triatomic molecule and explain the motion of a system. | CO4 | 20 |
|  |  |  |  |  |
| 7. | a. | Define Hamiltonian and derive Hamilton’s canonical transformation equation of motion. | CO4 | 10 |
|  | b. | Apply Hamilton’s equation to a simple pendulum and obtain the equation of motion of a simple pendulum. | CO6 | 10 |
| (OR) | | | | |
| 8. | a. | State Hamilton’s variational principle and derive the Lagrange’s equation of motion from that. | CO3 | 13 |
|  | b. | The Lagrangian for one dimensional harmonic oscillator is . Find the equation of motion using Hamilton’s principle. | CO5 | 7 |
|  | |  |  |  |
|  | | **Compulsory:** |  |  |
| 9. |  | Solve the Kepler’s problem by Hamilton Jacobi method. | CO4 | 20 |

ALL THE BEST