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



**UNIVERSITY**

(Karunya Institute of Technology & Sciences)

(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

**End Semester Examination – Nov/Dec – 2016**

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|  |  | **Semester :** | **2016-17 ODD** |
| **Code :** | **15PH3002** | **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. | Apply Lagrange’s equation of motion to solve Atwood’s machine system. | CO1 | 8 |
| b. | What is Hamilton’s principle? Deduce Lagrange’s equation of motion from Hamilton’s principle. | CO2 | 12 |
| **(OR)** | | | | |
| 2. | a. | Define constraints of a system. Explain different constraints of a dynamical system. | CO2 | 8 |
| b. | Explain the principle of virtual displacement and D’Alembert’s principle. Deduce the Lagrange’s equation of motion from D’Alembert’s principle. | CO2 | 12 |
| 3. | a. | Using Lagrangian equation of the particle in polar coordinates derive the  expression for r(t) and θ(t). | 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. | CO3 | 5 |
| 5. |  | Define Euler’s angle and find three independent parameters which is used to specify the orientation of rigid body with necessary diagrams. | CO2 | 20 |
| **(OR)** | | | | |
| 6. | a. | Two blocks of equal masses are tied with springs as shown in figure. They execute small oscillations on a frictionless surface. Find the normal frequencies and normal coordinates of oscillation of the system. | CO3 | 15 |
|  | b. | Deduce the normal frequencies of vibration of a linear triatomic molecule and explain the motion of a system. | CO1 | 5 |
| 7. | a. | Deduce the canonical equations from a variational principle | CO2 | 10 |
|  | b. | Show that the transformation  is canonical | CO1 | 10 |
| (OR) | | | | |
| 8. | a. | Define poisson brackets and write the properties of poisson brackets | CO2 | 10 |
|  | b. | If [φ, ψ] be the poisson bracket of φ and ψ then prove that | CO2 | 10 |
|  | | **Compulsory:** |  |  |
| 9. |  | Solve the Harmonic oscillator problem by Hamilton Jacobi method | CO3 | 20 |