Roll No.....................

Total No. of Section : 03
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Code No. : 01/201(A)

First Semester Examination, Dec. 2017

M.Sc. PHYSICS

Paper - II

CLASSICAL MECHANICS

Time : 3 Hrs. **Max.Marks : 80**

Note : Section 'A' consists of 10 very short answer type questions, all of which are compulsory and should be attempted first. Section 'B' consists of four short answer type questions with internal options. Section 'C' consists of four long answer type questions with internal choice.

Section - 'A'

Answer the following very short-answer-type questions in one or two sentences : (2x10=20)

Q.1 What is many particle system? Give an example.

Q.2 Define virtual work.

Q.3 What is boundary of relativistic and non relativistic dynamics?

Q.4 Which physical quantities are conserved under Galilean transformation?

Q.5 What are inertial forees? Give example.

Q.6 Define central force.

Q.7 State Kapler's second low of planetary motions.

Q.8 Write an application of principle of least action.

Q.9 What is meant by stability of orbits?

Q.10 Define Poisson bracket.

P.T.O.

Section - 'B'

Answer the following short-answer-type questions with word limit 200-250 : (5x4=20)

Q.1 State and explain different conservation laws in Newtonian mechanics.

OR

What are generalised coordinates? Write their application its classical mechanics.

Q.2 State and explain Lagrange's equation of motion and write its applications.

OR

Derive Einstein's mass-energy equation.

Q.3 What is Corioles force? Write its astronomical applications.

OR

State and prove Kapler's third law of planetary motion.

Q.4 Derive equation of motion of one dimensional harmonic oscillator using Hamilton's equations.

OR

State and prove Poisson's theorem.

Section - 'C'

Answer the following long-answer-type questions with word limit 400-450 : (10x4=40)

Q.1 Deduce the Lagrange's equation from D Alembert's principle and discuss the case of conservative system.

OR

Give a descriptive account of Newtonian mechanics of single and system of particles.

Q.2 Explain the following using Lagrangian formulation :

(i) Motion of a particle using polar coordinates

(ii) Linear harmonic oscillator.

OR

Derive Lorentz's transformation equations in terms of four vectors.

Q.3 How the two body problem can be converted into single body problem? Hence write their equation of motion using first integrals.

OR

What are terrestrial and astronomical applications of Coriolis force.

Q.4 Explain Hamilton - Jacobi equation for Hamilton's principle function.

OR

(a) Show that the Poisson's bracket is invariant under canonical transformations.

(b) If $[\phi,\psi]$ be the Poisson's bracket. Then prove that

$$\frac{\partial}{\partial t}[\phi,\psi]=\left[\frac{\partial\phi}{\partial t},\psi\right]+\left[\phi,\frac{\partial\psi}{\partial t}\right]$$

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