R-16

Code:3101

Faculty of Sciences

B.Sc (Physics) I-Year, CBCS –I Semester Examinations 2018-19

PAPER: MECHANICS

Time: 3 Hours | Max Marks: 80

Section-A

I. Answer any FIVE of the following questions (5x4=20 Marks)

1. If $\vec{r}$ is the position vector of a point, prove that curl $\vec{r} = 0$.
2. Show that $\vec{\nabla}.(\vec{\nabla} X \vec{A}) = 0$
3. Explain the terms impact parameter and scattering cross section.
4. State and explain the law of conservation of angular momentum.
5. State and prove Kepler's second law.
6. If the earth be one-half of its present distance from the sun, what will be the number of days in a year?
7. Explain the difference between inertial and Non-Inertial frames of reference.
8. Explain Length contraction.

Section-B

II. Answer the following questions (4x15=60 Marks)

9. (a) State and Prove Gauss's divergence theorem. The Surface 'S' is occupying a volume 'V'. The force vector $\vec{F} = 2x\hat{\imath} + 3y\hat{\jmath} + 3z\,\hat{k}$. Prove that $\iint_S \vec{F}.\vec{ds} = 8V$.

(OR)

(b) State and prove Green's first and second theorems.

10.(a) In two dimensional elastic collision, if a moving particle collides with another particle of same mass which is at rest, then prove that the particles will move in mutually perpendicular direction after the collision.

(OR)

(b) What is a rigid body? Derive the Euler equations for a rigid body rotating about a fixed point.

11.(a) Show that central force is conservative.
Show that the Force $\vec{F} = (y^2 - x^2)\,\hat{\imath} + 2xy\,\hat{\jmath}$ is conservative.

(OR)

(b) What is a central force? Give examples. Deduce the equation of motion of particle under the action of a central force.

12.(a) Describe Michelson-Morley experiment. Explain the physical significance of negative results.

(OR)

(b) State the postulates of special theory of Relativity. Derive Einstein's mass energy equivalence relation.

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