No. of Printed Pages 3

(48)

SARDAR PATEL UNIVERSITY

VALLABH VIDYANAGAR

B.Sc.(2nd Semester) Examination

Subject : PHYSICS

Course : US02CPHY01

(Classical Mechanics & Relativity)

Time : 3:00 p.m. to 5:00 p.m. **Date : 28/04/2011,Thursday**

Marks : 70

Instructions:

1. Attempt all questions.
2. Figures to the right indicate full marks.

Q – 1 Multiple choice questions. **10**

(1) A physical quantity having magnitude and direction is called
   (a) Scalar (b) Vector
   (c) N/m (d) Meter

(2) Gauss theorem is the relation between
   (a) Line integral and Surface integral
   (b) Force per unit area
   (c) Volume integral and Surface integral
   (d) Line integral and Volume integral

(3) If div $\vec{V}$=0 then, vector $\vec{V}$ is called
   (a) Irrotational Vector (b) Rotational Vector
   (c) Scalar Potential (d) Solenoidal Vector

(4) The angular momentum of the particle is
   (a) $\vec{L}=\vec{r}\times\vec{v}$ (b) $\vec{L}=\vec{r}\times\vec{p}$
   (c) $\vec{L}=\vec{p}\times\vec{v}$ (d) None of the above

(5) The ratio of electric field to magnetic induction is called
   (a) Linear velocity (b) Angular velocity
   (c) Drift velocity (d) Poisson's ratio

(6) If we increase the length of simple pendulum then its time period will
   (a) Increase (b) Decrease
   (c) Remain same (d) Become infinite

(7) The periodic time of a compound pendulum will be _____ when the axis of rotation passing through the CG.
   (a) Remain same (b) Minimum
   (c) Zero (d) Maximum

(8) The speed of light is
   (a) 3×10^{8} m/s (b) 3×10^{8} cm/s
   (c) 3×10^{-8} m/s (d) 3×10^{-8} cm/s

(9) Luminiferous ether has_____ density

(a) Zero (b) Very high

(c) Very low (d) Infinite

(10) The Lorentz transformations are converted in to Galilean transformation for _____

(a) Small velocity (b) Large velocity

(c) Small mass (d) None of above

Q – 2 Answer the following question in very short (Any Ten) **20**

(1) Define: Irrotational vector

(2) Define: Reciprocal vector

(3) Define: Unit vector

(4) State the Newton's second law of motion

(5) Write the condition for force $\vec{F}$ to be conservative

(6) Write the Lorentz equation for charge particle in electromagnetic field

(7) Define: Compound pendulum

(8) Write equation of time period for simple pendulum

(9) Define: Bar pendulum

(10) Define: Event

(11) Define: Observer

(12) Why Michelson-Morley experiment was performed?

Q -3 (a) Discuss the scalar triple product and derive the necessary equation. **06**

(b) Find the unit vector perpendicular to the surface $x^2 + y^2 - z^2 = 11$ at the point (4, 2, 3). **04**

OR

Q -3 (a) Discuss the divergence of vector point function and derive the necessary equation. **06**

(b) State and prove the Gauss' theorem. **04**

Q-4 (a) Prove that sum of kinetic and potential energy of a particle at every point in a conservative force field is constant. **06**

(b) Describe the Atwood machine and derive the expressions of acceleration and tension produced in the string. **04**

OR

Q-4	(a)	Discuss the motion of a charged particle in constant magnetic field and derive the equation of cyclotron frequency.	**06**
	(b)	Discuss the motion of a charged particle in a crossed field and derive the necessary equation of motion.	**04**
Q-5	(a)	Derive an expression for the time period of compound pendulum in terms of equivalent simple pendulum length.	**06**
	(b)	Prove that there are four points collinear with the centre of gravity of a compound pendulum about which the time period is same.	**04**

OR

Q-5	(a)	Describe the Bar pendulum for determination of acceleration due to gravity 'g' and radius of gyration 'k'.	**06**
	(b)	Derive the conditions of maximum and minimum time period of compound pendulum.	**04**
Q-6	(a)	Derive the Lorentz transformation equations.	07
	(b)	The mean life of elementary particle is 2×10^{-8} second. Calculate mean life of a particle moving with velocity of 0.8c	**03**

OR

Q-6	(a)	Describe the phenomena of Lorentz-Fitzgerald contraction.	**05**
	(b)	Write note on time dilation.	**05**

-x-