Enrollment No......................................

Faculty of Science
End Sem (Odd) Examination Dec-2018
BC3CO04 Physics-I

Programme: B.Sc. (CS)   Branch/Specialisation: Computer Science

Duration: 3 Hrs.   **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

Q.1   i.   The value of $\vec{\nabla} \times (\vec{\nabla}\varphi)$ is given by   **1**

         (a) 1   (b) 0   (c) -1   (d) $\nabla^2\varphi$

   ii.   If $\vec{A}.\vec{B} = 0$ the angle between $\vec{A}$ and $\vec{B}$ is :   **1**

         (a) $0°$ (b) $90°$ (c) $45°$ (d) $60°$

   iii.   The mass of a body at the centre of the earth is   **1**

         (a) Less than at surface   (b) Remains constant

         (c) More than at the surface   (d) Zero

   iv.   Two masses of 1gm and 4 gm are moving with equal kinetic energies. The ratio of their magnitude of their linear momentum is   **1**

         (a) 4:1   (b) 8: 1   (c) 1:2   (d) 1:16.

   v.   When 10^3 small droplets combine to form one big drop, the surface energy: **1**

         (a) Increases   (b) Decreases

         (c) Remains unchanged   (d) Becomes zero

   vi.   The viscosity of an ideal liquid is: **1**

         (a) Zero   (b) Infinite   (c) Negative   (d) Positive

   vii.   At mean position of a body executing simple harmonic motion, the velocity will be: **1**

         (a) Zero   (b) Minimum but not zero

         (c) Maximum   (d) Infinite

   viii.   The moment of inertia of a thin rod of mass *M* and length *L*. about an axis, passing through its end perpendicular to its length will be: **1**

         (a) $ML^2/3$ (b) $ML^2/12$ (c) $ML^2/2$ (d) $ML^2/6$

ix.   Length contraction happens only   **1**
(a) Along the direction of motion
(b) Parallel to direction of motion
(c) Perpendicular to direction of motion
(d) Both (a) and (b)

x.   Einstein's mass energy relation shows that   **1**
(a) Mass disappears to reappear as energy
(b) Energy disappears to reappear as mass
(c) Mass and energy are two different forms of the same entity
(d) All these statements are correct.

Q.2 i.   What is meant by the divergence of a vector field? Give its physical significance.   **2**

ii.   Evaluate $(2\hat{\imath} - 3\hat{\jmath}) . [(\hat{\imath} + \hat{\jmath} - \hat{k}) \times (\widehat{3\imath} - \widehat{k})]$.   **3**

iii.   State and prove Green's theorem.   **5**

OR iv.   State and prove Stokes' theorem.   **5**

Q.3 i.   Write down the Keplar's laws of planetary motion.   **3**

ii.   Give the equations of motion and graphical representation of motion of a freely falling body from a height h with the help of position time, velocity time and acceleration time graphs.   **7**

OR iii.   What do you understand by elastic and inelastic collisions? Two bodies of masses m_1 and m_2 are moving with velocities u_1 and u_2 respectively. Find their velocities after the elastic collision.   **7**

Q.4 i.   What is the effect of temperature and presence of impurity on surface tension of a liquid?   **3**

ii.   Establish the relation between, Young's modulus, bulk modulus and Poisson's ratio of an isotropic and homogeneous substance.   **7**

OR iii.   What are the different forms of energy in flowing liquid? Show that in stream line flow and frictionless flow of a liquid, the total mechanical energy of the liquid remains constant at each point.   **7**

Q.5 i.   You are given two spheres, one solid and other hollow of same mass and same radius. Which of the sphere will have greater moment of inertia about its diameter and why?   **3**

ii.   Obtain an expression for potential energy, kinetic energy and total energy for the simple harmonic oscillator and show its dependency on amplitude, time and position.   **7**

OR iii.   Explain the difference between inertia and moment of inertia. Determine the moment of inertia of a uniform thin and solid circular disc about an axis passing through
(a) Centre of gravity and perpendicular to its plane
(b) Its diameter.   **7**

Q.6   Attempt any two:

i.   How does the mass vary with velocity? Obtain the expression for it. Draw a graph showing the variation of mass with velocity. From it, show that the speed of light c is the ultimate speed of the material particles.   **5**

ii.   Describe Michelson-Morley's experimental arrangement with the help of diagram. Discuss the negative result of this experiment   **5**

iii.   Derive Lorentz Transformation.   **5**

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Marking Scheme
BC3CO04 Physics-I

Q.1   i.   The value of $\vec{\nabla} \times (\vec{\nabla}\varphi)$ is given by   **1**
(b) 0

ii.   If $\vec{A}.\vec{B} = 0$ the angle between $\vec{A}$ and $\vec{B}$ is :   **1**
(b) 90°

iii.   The mass of a body at the centre of the earth is   **1**
(d) Zero

iv.   Two masses of 1gm and 4 gm are moving with equal kinetic   **1**
energies. The ratio of their magnitude of their linear momentum is
(c) 1:2

v.   When 10^3 small droplets combine to form one big drop, the surface   **1**
energy:
(b) Decreases

vi.   The viscosity of an ideal liquid is: **1**
(a) Zero

vii.   At mean position of a body executing simple harmonic motion, the   **1**
velocity will be:
(c) Maximum

viii.   The moment of inertia of a thin rod of mass *M* and length *L*. about   **1**
an axis, passing through its end perpendicular to its length will be:
(a) $ML^2/3$

ix.   Length contraction happens only   **1**
(a) Along the direction of motion

x.   Einstein's mass energy relation shows that   **1**
(d) All these statements are correct.

Q.2   i.   Divergence   1 mark   **2**
Physical significance.   1 mark

ii.   For cross product   1.5 marks   **3**
For dot product   1.5 marks

iii.   Statement of Green's theorem.   2 marks   **5**
Proof   3 marks

OR   iv.   Statement of Stokes' theorem.   2 marks   **5**
Proof   3 marks

Q.3   i.   One mark each for three laws   (1 mark * 3)   **3**

ii.   Equations of motion for freely falling body   2.5 marks   **7**
Position time graph   1.5 marks
Velocity time graph   1.5 marks
Acceleration time graph   1.5 marks

OR   iii.   Elastic collision   1 mark   **7**
Inelastic collision   1 mark
Expression upto the conservation of linear momentum equation
  1.5 marks
Expression upto the conservation of kinetic energy equation
  1.5 marks
Rest derivation upto final equation.   2 marks

Q.4   i.   Effect of temperature   1.5 marks   **3**
Presence of impurity   1.5 marks

ii.   Figure   1 mark   **7**
Relation upto the expression of change in length (final equation)
  3 marks
Upto the desired relation   3 marks

OR   iii.   Names and equation of different forms of energy   1 mark   **7**
Expression upto the equation of work done   3 marks
Upto the desired relation   3 marks

Q.5   i.   Correct answer (Hollow sphere)   1 mark   **3**
Correct reason   2 marks

ii.   Upto the expression for potential energy   2 marks   **7**
Upto the expression for kinetic energy   2 marks
Total energy expression   1 mark
Dependency on amplitude, time and position.   2 marks

OR   iii.   Difference between inertia and moment of inertia   2 marks   **7**
Moment of inertia of disc about centre of gravity   3 marks
Moment of inertia of disc about its diameter.   2 marks

Q.6   Attempt any two:
i.   Mass vary with velocity   1 mark   **5**
Graph showing the variation of mass with velocity   0.5 mark
Expression of m_o 2.5 marks
Correct explanation of speed of light c is the ultimate speed of the
material particles.   1 mark

ii.	Diagram of setup	1 mark	**5**
	Michelson-Morley's experimental arrangement	2 marks	
	negative result of this experiment	2 marks	
iii.	Expression upto the value of x'	2 marks	**5**
	Expression upto the value of k'	2 marks	
	Correct from of Lorentz Transformation	1 mark	

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