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

Faculty of Science
End Sem (Odd) Examination Dec-2019
BC3CO04 Physics-I

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

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 divergence of position vector $\vec{r} = $?   **1**
       (a) 1   (b) 0   (c) 3   (d) 2

   ii.   Force is: **1**
       (a) Polar vector   (b) Scalar
       (c) Axial vector   (d) None of these

   iii.   The laws of Newton are applicable: **1**
       (a) In rotatory frame   (b) In inertial frame
       (c) In non-inertial frame   (d) In accelerated frame

   iv.   The strongest force is: **1**
       (a) Nuclear force   (b) Gravitational force
       (c) Weak force   (d) Electromagnetic force

   v.   The coefficient of viscosity of an ideal fluid is: **1**
       (a) Zero   (b) Infinite   (c) Negative   (d) Positive

   vi.   When a body is deformed, its internal energy: **1**
       (a) Increases   (b) Decreases
       (c) Remains unchanged   (d) None of these

   vii.   The radius of gyration of a body does not depend on: **1**
       (a) Its mass   (b) Distribution of its mass
       (c) Axis of rotation   (d) None of these

   viii.   In simple harmonic motion of a particle, the acceleration is: **1**
       (a) Always zero
       (b) Always constant
       (c) Maximum at extreme position
       (d) Minimum in equilibrium position

ix.	The correct transformations connecting the two inertial frames are:		**1**
	(a) Galilean	(b) Newtonian	
	(c) Lorentz	(d) None of these	
x.	The relativistic mass of a particle:		**1**
	(a) Decrease with velocity and become zero		
	(b) Decreases with velocity		
	(c) Increases or decreases with velocity		
	(d) Increases with velocity		

Q.2   i.   Prove that Curl of gradient of a scalar is zero.   **2**

      ii.   Explain the meaning of polar vector and unit vector.   **3**

      iii.   State and prove Gauss divergence theorem.   **5**

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

Q.3   i.   Differentiate between the centripetal and centrifugal force.   **2**

      ii.   State the Kepler's laws of planetary motion. Derive the Kepler's second and third law.   **8**

OR   iii.   State whether the velocity and acceleration are scalars or vectors? Justify your answer. Draw and explain the importance of acceleration-time graph, velocity-time graph and position – time graph for uniformly accelerated motion.   **8**

Q.4   i.   Prove that the Poisson's ratio has its values between -1 and +0.5 theoretically.   **3**

      ii.   State and prove Bernoulli's theorem.   **7**

OR   iii.   What is meant by surface tension? Explain the Jaeger's method for its determination.   **7**

Q.5   i.   A metallic ring of mass .5kg and diameter .5m is rotating about a vertical axis passing through its centre in a horizontal plane and completes 10 revolutions in 5sec. Calculate: **4**
         (a) Angular momentum of ring
         (b) Rotational kinetic energy.

      ii.   Discuss the oscillations of two masses connected at the ends of a massless spring.   **6**

OR   iii.   Deduce an expression representing the Euler's equations for the rotatory motion of a rigid body.   **6**

Q.6   Attempt any two:

      i.   Describe Michelson's Morley's experiment? Discuss the negative result of the experiment.   **5**

      ii.   Explain the meaning of time dilation and establish the expression for it.   **5**

      iii.   Deduce expression for the variation in mass with velocity.   **5**

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Q.1 i. The divergence of position vector $\vec{r}$ = ? **1**
(c) 3

ii. Force is: **1**
(a) Polar vector

iii. The laws of Newton are applicable: **1**
(b) In inertial frame

iv. The strongest force is: **1**
(a) Nuclear force

v. The coefficient of viscosity of an ideal fluid is: **1**
(a) Zero

vi. When a body is deformed, its internal energy: **1**
(a) Increases

vii. The radius of gyration of a body does not depend on: **1**
(a) Its mass

viii. In simple harmonic motion of a particle, the acceleration is: **1**
(c) Maximum at extreme position

ix. The correct transformations connecting the two inertial frames are: **1**
(c) Lorentz

x. The relativistic mass of a particle: **1**
(d) Increases with velocity

Q.2 i. Curl of gradient of a scalar is zero. **2**
Formula of gradient 0.5 mark
Formula for Curl 0.5 mark
Proof 1 mark

ii. Meaning of polar vector 1.5 marks **3**
Meaning of unit vector 1.5 marks

iii. Gauss divergence theorem **5**
Figure 1 mark
Statement 1 mark
Proof 3 marks

OR iv. Stokes' theorem. **5**
Figure 1 mark
Statement 1 mark
Proof 3 marks

Q.3 i. Difference b/w the centripetal and centrifugal force **2**
1 mark for each difference (1 mark * 2)

ii. Kepler's laws of planetary motion, Kepler's second and third law **8**
Statement of three laws 3 marks
Second law proof 2.5 marks
Third law proof 2.5 marks

OR iii. Velocity and acceleration are scalars or vectors 1 mark **8**
Justification 1 mark
Importance of acceleration-time graph 2 marks
Velocity-time graph 2 marks
Position-time graph 2 marks

Q.4 i. Relation b/w Poisson's ratio. Young's modulus, bulk modulus and **3**
modulus of rigidity 1 mark
Proof 2 marks

ii. Bernoulli's theorem **7**
Figure 1 mark
Statement 2 marks
Proof 4 marks

OR iii. Definition of surface tension 2 marks **7**
Jaeger's method set-up 2 marks
Explanation 3 marks

Q.5 i. (a) Angular momentum of ring **4**
Formula for physical quantity 1 mark
Solution 1 mark
(b) Rotational kinetic energy
Formula for physical quantity 1 mark
Solution 1 mark

ii. Oscillations of two masses connected at the ends of a massless spring **6**
Figure 2 marks
Discussion 4 marks

OR iii. Expression representing the Euler's equations for the rotatory motion **6**
of a rigid body
Expression for Newton's second law, in inertial frame
1 mark
Principle components of angular velocity 2 marks
Final result and solution 3 marks

Q.6   Attempt any two:

i.   Michelson's Morley's experiment   **5**

        Figure   1 mark

        Description   2 marks

        Negative result   2 marks

ii.   Meaning of time dilation   2 marks   **5**

        Expression and derivation   3 marks

iii.   Expression for the variation in mass with velocity   **5**

        Proof   4 marks

        Graph   1 mark

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