M.Sc. MATHEMATICS
THIRD SEMESTER
SPECIAL THEORY OF RELATIVITY
MSM - 304A
[USE OMR FOR OBJECTIVE PART]

SET A

Duration: 1:30 hrs.   **Full Marks: 35**

(**Objective**)

Time: 15 mins.   **Marks: 10**

Choose the correct answer from the following: **1×10=10**

1. For a material particle which is moving with velocity u

   a. $\dfrac{dx}{d(ct)} < 1$

   b. $\dfrac{dx}{d(ct)} > 1$

   c. $\dfrac{dx}{d(ct)} = 1$

   d. $\dfrac{dx}{d(ct)} \neq 1$

2. Four-dimensional Euclidean flat space time is

   a. $dS^2 = dx^2 + dy^2 + dz^2 - c^2 dt^2$

   b. $dS^2 = dx^2 + dy^2 + dz^2 + c^2 dt^2$

   c. $- dS^2 = dx^2 + dy^2 + dz^2 + c^2 dt^2$

   d. None of the above

3. Result of Galilean transformation

   a. Maxwell's laws are invariant Newton's laws of Mechanics are

   b. Maxwell's laws are not invariant Newton's laws of Mechanics are

   c. invariant in all inertial frame of refference

   d. invariant in all non-inertial frame of refference

4. The condition which shows that the Lorentz transformation converted to Galilean Transformation

   a. $v \gg c$

   b. $v \ll c$

   c. $v < c$

   d. $v > c$

5. Einstein's Velocity Addition Theorem is

   a. $u = \dfrac{u' - v}{1 - \dfrac{vu'}{c^2}}$ u, u' are respectively the velocity of particle according to S and S'

   and , v, c are velocity of moving frame and light

b. $u = \dfrac{u' - v}{1 + \dfrac{vu'}{c^2}}$ u, u' are respectively the velocity of particle according to S and S'

and , v, c are velocity of moving frame and light

c. $u = \dfrac{u' + v}{1 + \dfrac{vu'}{c^2}}$, u, u' are respectively the velocity of particle according to S and S'

and , v, c are velocity of moving frame and light

d. $u = \dfrac{u' + v}{1 - \dfrac{vu'}{c^2}}$ u, u' are respectively the velocity of particle according to S and S'

and , v, c are velocity of moving frame and light

6. One of the consequence of Lorentz Transformation is
   a. Doppler Effect
   b. Galilean Equation
   c. Length contraction
   d. Relativisstic Equation

7. The material particle travelling slower than light and have real mass is called
   a. Tachyons
   b. Luxons
   c. Tardyons
   d. None of the above

8. A train is moving with a initial velocity 4km/hour. After some time its velocity gradually increasing. Motion is an example of
   a. Absolute motion
   b. Uniform motion
   c. Non-uniform motion
   d. Relative motion

9. Which of the following option is correct,where l is the length of the rode measured from S observer and l' is the length of the rode measured from S' observer
   a. $l' > l$, where l, l' are the length measured from S, S'
   b. $l' < l$, where l, l' are the length measured from S, S'
   c. $l' = l$, where l, l' are the length measured from S, S'
   d. $l' < l$, where l, l' are the length measured from S', S

10. Fresnl Drag corfficient is
    a. $\left(1 + \dfrac{1}{n^2}\right)$
    b. $\left(1 + \dfrac{1}{n}\right)$
    c. $\left(1 - \dfrac{1}{n}\right)$
    d. $\left(1 - \dfrac{1}{n^2}\right)$

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(Descriptive)

[Answer question no. 1 & any two (2) from the rest]

1. What are the real life example of consequence of Lorentz Transformation? Explain any one consequences of Lorentz transformation.   2+3=5

2. In Minkowski Geometry Write the definition of three region   3+2+5 =10
   a. Space-like
   b. Time-like
   c. light-like

   Write the condition of time-like interval and space-like interval?Draw the diagram of world line of different type of particles?

3. State and Proof the statement "Eather does not exist" by an experiment.   2+8=10

4. Write four difference between Galilean Transformation and Lorentz transformation . Prove that Maxwell's Electromagnetic theory are not invariant under Galilean transformation.   4+6=10

5. Define briefly of the following   5+5=10
   a. Doppler's Effect
   b. Principle of Special Relativity
   c. Time-like Region
   d. Fresnel Drag effect
   e. Lorentz Transformation

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