SARDAR PATEL UNIVERSITY
M.Sc. (Mathematics) (III Semester) Examination
Tuesday, 7 November 2017
10.00 am - 1.00 pm
PS03EMTH16 - Relativity - I

Total Marks : 70

Note: 1. Answer to all questions to be given in the answer book only.
2. Figures on the right indicate full marks.

Q-1   Choose appropriate answer from the options given.   (08)
1.   In General Galelian transformation time coordinate is _____.
         (a) relative   (b) absolute   (c) not defined   (d) none of these
2.   Maxwell's equations are not invariant under _____ transformation.
         (a) General Lorentz   (b) General Lorentz
         (c) Special Galelian   (d) None of these
3.   A frame in rotational motion relative to an inertial frame is _____
         (a) an inertial frame   (b) a special frame
         (c) a non-inertial frame   (d) not a frame
4.   Shape of an object is_____ under Special Lorentz transformations
         (a) changes   (b) does not change   (c) non-deterministic   (d) rectangular
5.   In Special Relativity, moving clocks appear to run _____
         (a) slow   (b) fast   (c) with constant speed   (d) uniformly
6.   Velocity 4-vector is _____.
         (a) space-like   (b) of constant magnitude   (c) null   (d) contravariant
7.   Which one of the following is not correct according to Special Relativity?
         (a) Mass is equivalent to energy.
         (b) Mass changes with motion.
         (c) Mass of a particle remains constant during the motion.
         (d) Rest mass and moving mass of a photon are different.
8.   The type of Riemann curvature tensor is of _____ type.
         (a) (4,0)   (b) (0,4)   (c) (0,2)   (d) (2,0)

Q-2   Attempt any SEVEN   (14)
1.   Show that Newton's equations are invariant under special Galelian transformation.
2.   Why Michelson-Morley experiment was performed?
3.   State the formula for relativistic composition of velocities.
4.   Explain the meaning of length contraction.
5.   When two events are said to be simultaneous?
6.   Define a null vector.
7.   State the expression of transformation of a contravariant vector.
8.   What are various spacetime structures?
9.   Show that gradient of a scalar is a covariant vector.

(P.T.O.)