Roll No. .....

Question Booklet Number

O. M. R. Serial No.

M. A./M. Sc. (Fourth Semester)
(NEP) EXAMINATION, 2025-26
MATHEMATICS
(Special Theory of Relativity) (Elective)

Paper Code							
B	0	3	1	0	0	5	T

Questions Booklet Series
B

Time : 1:30 Hours] [*Maximum Marks : 75*

Instructions to the Examinee :

1. Do not open the booklet unless you are asked to do so.

2. The booklet contains 100 questions. Examinee is required to answer 75 questions in the OMR Answer-Sheet provided and not in the question booklet. All questions carry equal marks.

3. Examine the Booklet and the OMR Answer-Sheet very carefully before you proceed. Faulty question booklet due to missing or duplicate pages/questions or having any other discrepancy should be got immediately replaced.

परीक्षार्थियों के लिए निर्देश :

1. प्रश्न-पुस्तिका को तब तक न खोलें जब तक आपसे कहा न जाए।

2. प्रश्न-पुस्तिका में 100 प्रश्न हैं। परीक्षार्थी को 75 प्रश्नों को केवल दी गई OMR आन्सर-शीट पर ही हल करना है, प्रश्न-पुस्तिका पर नहीं। सभी प्रश्नों के अंक समान हैं।

3. प्रश्नों के उत्तर अंकित करने से पूर्व प्रश्न-पुस्तिका तथा OMR आन्सर-शीट को सावधानीपूर्वक देख लें। दोषपूर्ण प्रश्न-पुस्तिका जिसमें कुछ भाग छपने से छूट गए हों या प्रश्न एक से अधिक बार छप गए हों या उसमें किसी अन्य प्रकार की कमी हो, तो उसे तुरन्त बदल लें।

(Remaining instructions on the last page) **(शेष निर्देश अन्तिम पृष्ठ पर)**

(Only for Rough Work)

1. An electron and positron, practically at rest, come together and annihilate each other, then the energy released will be :

(A) 1.62×10^{-6} erg

(B) 1.52×10^{-6} erg

(C) 1.42×10^{-6} erg

(D) 1.72×10^{-6} erg

2. If the relative velocity of an electron is 0.8 c and the rest mass is 9.1×10^{-31} kg, then total energy of electron is :

(A) 8.19×10^{-14} joule

(B) 7.46×10^{-14} joule

(C) 5.46×10^{-14} joule

(D) 9.19×10^{-14} joule

3. If t he relative velocity of an electron is 0.8 c and the rest mass is 9.1×10^{-31} kg, then the relative kinetic energy is :

(A) 8.19×10^{-14} joule

(B) 7.46×10^{-14} joule

(C) 5.46×10^{-14} joule

(D) 9.19×10^{-14} joule

4. When the speed of a moving particle increases to be equal to the speed of light, then how much energy will be required ?

(A) 0

(B) c

(C) ∞

(D) None of the above

5. The relation between momentum and energy is :

(A) $E^2 = p^2c^2 - m_0^2c^4$

(B) $E^2 = p^2c^2 - m_0^2c^2$

(C) $E^2 = p^2c^2 + m_0^2c^4$

(D) $E^2 = p^2c^2 + m_0^2c^2$

6. What is the trace of $T = T_{\mu}^{\mu}$, the energy-momentum tensor for incoherent matter ?

(A) $3P - \rho$

(B) $-\rho$

(C) 0

(D) 4ρ

7. The energy-momentum tensor of incoherent matter satisfies which conservation law ?

(A) $\nabla_\mu T^{\mu\nu} = 0$

(B) $\nabla_\mu T^{\mu\nu}$ = constant

(C) $\nabla_\mu T^{\mu\nu} = \rho$

(D) $T^{\mu\nu}$ is not conserved

8. The relativistic kinetic energy (K) of a particle is given by :

(A) $\frac{1}{2} m_0 v^2$

(B) $(\gamma - 1) m_0 c^2$

(C) $\gamma m_0 c^2$

(D) $\frac{1}{2} \gamma m_0 v^2$

9. A particle moves at a speed such that its relativistic momentum is 3 times its classical momentum $(m_0 v)$, then its Lorentz factor γ is :

(A) $\gamma = 1$

(B) $\gamma = \sqrt{3}$

(C) $\gamma = 3$

(D) $\gamma = 9$

10. As per relativistic mechanics, if a stationary body explodes into fragments, each of mass 1 kg, that move apart at speeds of 0.6*c* (*c* is the speed of light) relative to the original body, then the mass of the original body is :

(A) 1.5 kg

(B) 2.5 kg

(C) 3.5 kg

(D) 4.5 kg

11. Which form of energy is possessed by a horse running on a level road ?

(A) Potential Energy

(B) Kinetic Energy

(C) Work Energy

(D) Heat Energy

12. What would be the momentum of the bullet and the gun before firing ?

(A) The momentum of the bullet and the gun before firing would be zero

(B) The momentum of the bullet would be more than that of the gun

(C) The momentum of the gun would be more than that of the bullet

(D) Both would have a certain velocity and so have the same momentum

13. A unique idea that was considered in the special theory of relativity was :

(A) The time-period of any event in every frame of refrance will be the same

(B) The speed of light will be constant for all frames of reference

(C) For observers, all laws related to physical phenomena are different in different inertial reference frames

(D) A particle or an entity of a certain mass can travel at a speed that is greater than the speed of light in a vacuum

14. According to the principle of equivalence, which two types of mass are considered equivalent ?

(A) Atomic mass and Molecular mass

(B) Rest mass and Relativistic mass

(C) Inertial mass and Gravitational mass

(D) Active mass and Passive mass

15. The principle of equivalence led Einstein to realize that gravity is not a traditional 'force' but rather :

(A) A form of magnetism

(B) The curvature of spacetime

(C) A result of atmospheric pressure

(D) An illusion caused by the Earth's rotation

16. Mathematically, the Principle of General Covariance is ensured by expressing physical laws in terms of :

(A) Scalars only

(B) Vectors only

(C) Tensor equations

(D) Coordinate-dependent matrices

17. The Principle of General Covariance effectively eliminates the idea of :

(A) Absolute space and time

(B) Mass-energy equivalence

(C) Quantum fluctuations

(D) Gravitational waves

18. The Einstein tensor $G_{\mu\nu}$ is defined as :

(A) $R_{\mu\nu} + \frac{1}{2} R g_{\mu\nu}$

(B) $R_{\mu\nu} - \frac{1}{2} R g_{\mu\nu}$

(C) $R_{\mu\nu} - R g_{\mu\nu}$

(D) $R_{\mu\nu} + g_{\mu\nu} \wedge$

19. How many independent components does the Einstein field equation have in 4D space-time ?

(A) 4

(B) 16

(C) 10

(D) 1

20. Which tensor describes the metric properties (distances and angles) of space-time ?

(A) $T_{\mu\nu}$

(B) $G_{\mu\nu}$

(C) P (Pressure)

(D) ρ (Density)

21. What is the rank of the energy-momentum tensor ?

(A) 4

(B) 0

(C) 2

(D) 1

22. To recover the classical Newtonian limit from general relativity, which of the following conditions must be met ?

(A) Particles must move at the speed of light

(B) The gravitational field must be weak and static

(C) The cosmological constant must be negative

(D) Space-time must be highly curved

23. The Geodesic Equation describes the motion of a particle influenced only by :

(A) Electromagnetism

(B) Nuclear Forces

(C) Spacetime Curvature (Grativy)

(D) Friction

24. In the classical limit, the component of the metric tensor is approximately :

(A) $1 + 2\phi$

(B) $-\left(1+2\phi/c^2\right)$

(C) $e^{2\phi}$

(D) 0

25. In field theory, forces are introduced via :

(A) Boundary conditions only

(B) Coupling terms in the Lagrangian

(C) Initial conditions

(D) Coordinate transformation

26. The mathematical object that describes spacetime geometry is :

(A) Scalar potential

(B) Hamiltonian

(C) Wave function

(D) Metric tensor

27. The Einstein field equations relate to :

(A) Force and acceleration

(B) Pressure and temperature

(C) Charge and field

(D) Curvature and matter-energy

28. Which of the following years Doppler effect was classified ?

(A) 1905

(B) 1908

(C) 1842

(D) None of the above

29. What will be the percentage contraction of a rod moving with a velocity of 0.8 c in a direction inclined at 60° to its own length ?

(A) 27.7%

(B) 10.7%

(C) 8.4%

(D) 16.4%

30. The value of 1 electron volt is :

(A) 1.6×10^{-12} ergs

(B) 1.4×10^{-12} ergs

(C) 2.7×10^{-7} ergs

(D) 1.6×10^{-6} ergs

31. What will be the percentage contraction of a rod moving with velocity 0.8 c along its own length ?

(A) 30%

(B) 40%

(C) 45%

(D) 50%

32. Two particles are moving along a straight line towards each other with uniform velocities of 0.8 c and 0.5 c, respectively; then the relative velocity of approach between them is :

(A) 0.40c

(B) 0.13c

(C) 0.20c

(D) 0.93c

33. Two particles are emitted by a disintegrating source moving with speed 0.9 c with respect to the source, then their speed relative to each other is :

(A) $0.18c$

(B) $0.81c$

(C) $0.99c$

(D) $0.90c$

34. The relativistic Doppler frequency shift formula for light, where v_0 is the source frequency, v is the relative speed, θ is the angle between the velocity vector and the direction of wave propagation, and $\gamma = 1\sqrt{1-v^2/c^2}$, is :

(A) $v = v_0\sqrt{1-v/c}$

(B) $v = \gamma v_0\left(1-(v/c)\cos\theta\right)$

(C) $v = \gamma v_0\left(1+(v/c)\cos\theta\right)$

(D) $v = v_0\left(1+v/c\right)$

35. A light source moves directly towards an observer at a relativistic speed v. The observed frequency v is related to the source frequency v_0 by :

(A) $v = v_0\sqrt{\dfrac{1-v/c}{1+v/c}}$

(B) $v = v_0\sqrt{\dfrac{1+v/c}{1-v/c}}$

(C) $v = v_0\left(1+v/c\right)$

(D) $v = v_0\left(1-v/c\right)$

36. The transverse Doppler effect (observed when the source moves perpendicular to the line of sight) is a purely relativistic phenomenon caused by :

(A) Length contraction

(B) Time dilation

(C) Frame dragging

(D) Classical frequency modulation

37. If u and v are two velocities in the same direction and V their resultant velocity given by $\tan \hbar^{-1} \frac{V}{c} = \tan \hbar^{-1} \frac{\mu}{c} + \tan \hbar^{-1} \frac{v}{c}$, then by law of composition of velocities from this equation is :

(A) $\frac{u+v}{1+\frac{uv}{c^2}}$

(B) $\frac{u-v}{1-\frac{uv}{c^2}}$

(C) $\frac{u+v}{1-\frac{uv}{c^2}}$

(D) $\frac{u+v}{1+\frac{uv}{c}}$

38. Four-dimensional volume element $dx\ dy\ dz\ dt$ will be invariant under :

(A) Fourier transformation

(B) Maxwell transformation

(C) Laplace transformation

(D) Lorentz transformation

39. The result $(ds)^2 = (dx)^2 + (dy)^2 + (dz)^2 - (cdt)^2$ will be invariant under :

(A) Fourier transformation

(B) Maxwell transformation

(C) Laplace transformation

(D) Lorentz transformation

40. The Lorentz transformation are equivalent to rotation of axis in four dimensional space through an imaginary angle :

(A) $\sin \frac{i\beta}{\sqrt{(1-\beta^2)}}$

(B) $\tan(i\beta)$

(C) $\cos^{-1} \frac{i\beta}{\sqrt{(1-\beta^2)}}$

(D) $\tan^{-1}(i\beta)$

41. The correct relation for time dilation is :

(A) $t = t_0 - v_x$

(B) $t_0 = \dfrac{t}{\sqrt{1-\dfrac{v^2}{c^2}}}$

(C) $t = t_0\sqrt{1-\dfrac{v^2}{c^2}}$

(D) $t = \dfrac{t_0}{\sqrt{1-\dfrac{v^2}{c^2}}}$

42. The correct formula for length contraction is :

(A) $\mathrm{L} = \mathrm{L}_0\left(1-\dfrac{v^2}{c^2}\right)$

(B) $\mathrm{L} = \mathrm{L}_0\sqrt{1-\dfrac{v}{c}}$

(C) $\mathrm{L} = \mathrm{L}_0\sqrt{1-\dfrac{v^2}{c^2}}$

(D) $\mathrm{L} = \mathrm{L}_0 - vt$

43. An electron gains energy so that its mass becomes 2 m_0. Then its speed is :

(A) $\dfrac{\sqrt{3}}{2}c$

(B) $\dfrac{3c}{4}$

(C) $\dfrac{3c}{2}$

(D) $\sqrt{\dfrac{3}{2}}.c$

44. The rest mass of photon is :

(A) $\dfrac{h}{\lambda c}$

(B) $\dfrac{hv}{c}$

(C) 0

(D) $\dfrac{h}{\lambda p}$

45. A particle of mass 'm' has a momentum 'mc'. Then its kinetic energy is :

(A) 1.32 mc^2

(B) 0.41 mc^2

(C) mc^2

(D) 0.9 mc^2

46. An electron has velocity 0.99 c. Then its energy will be :

(A) 3.6 MeV

(B) 0.31 MeV

(C) 31 MeV

(D) 0.31 MeV

47. When the force F is parallel to *v*, then relativistic form of Newton's second law is :

(A) $F = m_0 \frac{dv}{dt}\left(1-\frac{v^2}{c^2}\right)^{-3/2}$

(B) $F = m_0 \frac{dv}{dt}\left(1-\frac{v^2}{c^2}\right)^{3/2}$

(C) $F = m_0 \frac{dv}{dt}\left(1-\frac{v^2}{c^2}\right)^{-1/2}$

(D) $F = m_0 \frac{dv}{dt}\left(1-\frac{v^2}{c^2}\right)^{1/2}$

48. If l_0^3 is the rest volume of a cube, then what will be the volume viewed from a reference frame moving in a direction parallel to an edge of a cube ?

(A) $l_0^3\left(1-\beta^2\right)^{1/2}$

(B) $l_0^3\left(1+\beta^2\right)^{1/2}$

(C) $l_0^3\left(1-\beta^2\right)^{-1/2}$

(D) None of the above

49. If μ is the refractive index of water, then Fresnel's coefficient of drag from relativistic velocity addition theorem is :

(A) $1+\frac{1}{\mu^2}$

(B) $1-\frac{1}{\mu^2}$

(C) $\sqrt{1+\frac{1}{\mu^2}}$

(D) $\sqrt{1-\frac{1}{\mu^2}}$

50. Which of the following is an example of an energy-momentum tensor component ?

(A) Time

(B) Force

(C) Pressure

(D) Length

51. Before Einstein, what was the hypothetical medium believed to be necessary for the propagation of light ?

(A) Dark Matter

(B) Luminiferous Ether

(C) Plasma

(D) Vacuum Flux

52. In which year did Albert Einstein publish his paper on Special Relativity ?

(A) 1901

(B) 1905

(C) 1915

(D) 1921

53. Which of the following is the first postulate of Special Relativity ?

(A) Energy is always conserved

(B) The laws of physics are the same in all inertial frames of reference

(C) Gravity bends light

(D) Time is absolute

54. Which scientist's equations of electromagnetism were already consistent with Special Relativity before 1905 ?

(A) Isaac Newton

(B) James Clerk Maxwell

(C) Galileo Galilei

(D) Johannes Kepler

55. Special Relativity deals with frames of reference that are :

(A) Accelerating

(B) Non-inertial

(C) Moving at constant velocity

(D) Only at rest

56. If a spaceship travels at 0.5 c and turns on a headlight, an observer on Earth measures the light speed as :

(A) 0.5c

(B) 1.5c

(C) c

(D) 0.75c

57. The 'Annus Mirabilis' (Miracle Year) refers to which year ?

(A) 1895

(B) 1905

(C) 1919

(D) 1945

58. The concept of 'Simultaneity' in Special Relativity is :

(A) Absolute

(B) Relative (depends on the observer's frame)

(C) Only true for objects at rest

(D) A mathematical error

59. Which experiment confirmed time dilation using atomic clocks on planes ?

(A) The Cavendish Experiment

(B) The Hafele-Keating Experiment

(C) The Young's Slit Experiment

(D) The Stern-Gerlach Experiment

60. Special Relativity suggests that nothing with mass can travel :

(A) Faster than sound

(B) Slower than light

(C) At or faster than the speed of light

(D) In a vacuum

61. Einstein's Second Postulate directly contradicts which branch of :

(A) Classical (Newtonian) Mechanics

(B) Thermodynamics

(C) Quantum Mechanics

(D) Optics

62. Which mathematical transformations replaced the Galilean Transformations ?

(A) Fourier Transformations

(B) Lorentz Transformations

(C) Laplace Transformations

(D) Maxwell Transformations

63. What did the Galilean Transformation fail to explain ?

(A) Falling objects

(B) The invariance of the speed of light

(C) Planetary orbits

(D) The conservation of momentum

64. In the Michelson-Morley experiment, the wave length of the monochromatic light used is 5000 Å. What will be the expected fringe-shift on the basis of stationary ether hypothesis if the effective length of each path be 5 meters ? Given velocity of earth $= 3\times10^4$ m/sec., and $c = 3\times10^8$ m/sec.

(A) 0.5 m

(B) 0.4 m

(C) 0.3 m

(D) 0.2 m

65. In an experiment, the length of the arm of the interferometer was 11 meters, the wavelength of light was 5.5×10^{-5} cm and the earth's velocity 3×10^4 m/sec, calculate the amount of fringe-shift :

(A) 0.5

(B) 0.4

(C) 0.3

(D) 0.2

66. What does phrase 'Simultaneity is not absolute' mean ?

(A) Events never happen at the same time

(B) Time flows backward for moving observers

(C) Events simultaneous in one frame may not be simultaneous in another

(D) All observers always agree on the order of events

67. Which factor causes the loss of absolute simultaneity in Special Relativity ?

(A) The invariant (constant) speed of light

(B) The existence of the ether

(C) The acceleration of the Earth

(D) The variable speed of light in a vacuum

68. The relativity of simultaneity is a direct consequence of which mathematical tool ?

(A) Galilean Transformations

(B) Fourier Series

(C) Maxwell's Equations

(D) Lorentz Transformations

69. Two events occur at the same location but at different times in Frame S. In Frame S', moving relative to S, these events will :

(A) Also occur at the same location

(B) Always be simultaneous

(C) Occur at different locations

(D) Not be measurable

70. For an observer to see two spatially separated events as simultaneous, the light signals from both must :

(A) Be emitted at the speed of sound

(B) Be detected by a stationary ether

(C) Reach the observer at the same time

(D) Be emitted at the same time in that observer's frame

71. The resultant of two velocities, each of which is less than c, is also (here c be velocity of light) :

(A) less than c

(B) greater than c

(C) less than equal to c

(D) equal to c

72. The addition of any velocity to the velocity of the light is always be (where c be velocity of light) :

(A) less than c

(B) greater than c

(C) less than equal to c

(D) equal to c

73. Suppose the half life of a certain particle is 10^{-7} second, when it is at rest. What will be its half life when it is travelling with a speed of 0.99 *c* ?

(A) 7.087×10^{-7}

(B) 6.087×10^{-7}

(C) 5.087×10^{-7}

(D) None of the above

74. A particle with a mean proper life of 1 μ second moves through the laboratory at 2.7×10^{10} cm/sec. What will be its life as measured by an observer in the laboratory ?

(A) 2.7 μ seconds

(B) 2.4 μ seconds

(C) 2.3 μ seconds

(D) None of the above

75. A particle with a mean proper life of 1 μ second moves through the laboratory at 2.7×10^{10} cm/sec. What will be the distance transverse by it before disintegrating ?

(A) 270 meter

(B) 621 meter

(C) 627 meter

(D) None of the above

76. A particle with a mean proper life of 1 μ second moves through the laboratory at 2.7×10^{10} cm/sec. What will be the distance transverse without taking relativity into account ?

(A) 270 meter

(B) 621 meter

(C) 627 meter

(D) None of the above

77. Aberration of light from stars is caused due to :

(A) The travelling of light in the atmosphere

(B) Elliptical orbit of the Earth around the Sun

(C) The finite speed of light and the speed of the Earth in its orbit around the sun

(D) The scattering of light by the air particles

78. Lorentz transformation reduces to Galilean on if :

(A) $v = c$

(B) $v << c$

(C) $v >> c$

(D) None of the above

79. Two particles are moving in opposite direction each with a speed of 0.9 *c*. The velocity of one particle with respect to another is :

(A) 0

(B) 0.9 *c*

(C) 0.994 *c*

(D) 0.5 *c*

80. The Doppler Effect in light is used by traffic police in speed guns to detect :

(A) Vehicle color

(B) Vehicle weight

(C) Vehicle speed

(D) Driver identity

81. The 'Blue Shift' in the spectrum of a star indicates that the star is :

(A) Cooling down

(B) Exploding

(C) Moving away from the observer

(D) Moving toward the observer

82. If an observer moves toward a stationary source of sound, the speed of the waves relative to the observer :

(A) Increases

(B) Decreases

(C) Remains constant at 343 m/s

(D) Becomes negative

83. If both the source and the observer are moving at the same velocity in the same direction, the change in observed frequency is :

(A) Doubled

(B) Halved

(C) Zero

(D) Infinite

84. The path an object traces through space-time is called its :

(A) Light cone

(B) Invariant interval

(C) World line

(D) Hyper surface

85. If the vertical axis is *ct* and the horizontal axis is *x*, the world line of a photon starting at the origin is a line with a slope of :

(A) 0^0

(B) 30^0

(C) 45^0

(D) 90^0

86. An object at rest in the chosen reference frame has a world line that is :

(A) Horizontal

(B) Vertical

(C) Slanted at 45°

(D) A curved hyperbola

87. A 'Time-like' separation between two events means :

(A) They can be connected by a cause-and-effect relationship

(B) They must occur at the same place

(C) They must occur at the same time

(D) They can only be connected by a light signal

88. If the observer and the source are moving with speed '*v*' and 'V' respectively, then according to the Doppler effect in sound, the relationship between the source frequency (μ_0) and observed frequency (μ) (where '*c*' = speed of sound) is :

(A) $\mu = \mu_0 \left(\frac{1+\frac{v}{c}}{1-\frac{V}{c}} \right)$

(B) $\mu = \mu_0 \left(\frac{1-\frac{v}{c}}{1+\frac{V}{c}} \right)$

(C) $\mu = \mu_0 \left(\frac{1+\frac{V}{c}}{1-\frac{V}{c}} \right)$

(D) $\mu = \mu_0 \left(\frac{1-\frac{V}{c}}{1+\frac{V}{c}} \right)$

89. A person observers two moving trains, 'A' reaching the station and 'B' leaving the station with equal speed of 30 m/s. If both trains emit sounds with frequency 300 Hz (Speed of sound : 330 m/s), approximate difference of frequencies heard by the person will be :

(A) 33 Hz
(B) 50 Hz
(C) 55 Hz
(D) 63 Hz

90. The apparent change in frequency of a note (or pitch) whenever there is a relative motion between source and listener is known as :

(A) Piezoelectric Effect

(B) Compton Effect

(C) Doppler Effect

(D) Seebeck Effect

91. An observer is moving towards a stationary source of frequency 250 Hz with a velocity of 40 m/s. If the velocity of sound is 330 m/s, the apparent frequency heard by the observer will be :

(A) 280 Hz

(B) 300 Hz

(C) 320 Hz

(D) None of the above

92. Which of the following statements is correct for the Doppler effect ?

(a) The apparent frequency will be more than the actual frequency when the observer moves towards the stationary source.

(b) The apparent frequency will be more than the actual frequency when the source moves towards the stationary observer.

Codes :

(A) Only (a) is correct

(B) Only (b) is correct

(C) Both (a) and (b) are correct

(D) Neither (a) nor (b) is correct

93. Which of the following is related to Doppler effect ?

(A) Sound

(B) Magnetism

(C) Force

(D) Motor

94. Which one among the following waves bats use to detect the obstacles in their flying path ?

(A) Infrared waves

(B) Electromagnetic waves

(C) Ultrasonic waves

(D) Radio waves

95. A young lady of 25 years starts running with velocity 0.6 *c*, then her age would appear to her stationary friends as :

(A) Increased

(B) Decreased

(C) No change

(D) First increased and then decreased

96. A young lady of 25 years starts running with velocity 0.8 *c*. After 5 years, her age would appear to her stationary friend as :

(A) 22 years

(B) 20 years

(C) 28 years

(D) 30 years

97. In a Minkowski spacetime diagram, what does the 'Null Cone' represent ?

(A) The path on an accelerating twin.

(B) The boundary of all possible paths for light $(v = c)$.

(C) The region where time flows backward

(D) The path of the stationary twin

98. How is the 'Interval' (s^2) defined for a path along the surface of a Null Cone ?

(A) $s^2 > 0$ (Space-like)

(B) $s^2 < 0$ (Time-like)

(C) $s^2 = 0$ (Null)

(D) $s^2 = 1$

99. If the traveling twin moved at exactly the speed of light (on the Null Cone), how much time would they perceive passing during the trip ?

(A) More time than the Earth twin

(B) The same amount of time

(C) Zero time

(D) Infinite time

100. What is the velocity at which the mass of the particle becomes 8 times its rest mass ?

(A) 2.976×10^{10} cm/sec

(B) 2.76×10^{10} cm/sec

(C) 2.967×10^{10} cm/sec

(D) 2.956×10^{10} cm/sec

(Only for Rough Work)

4. Four alternative answers are mentioned for each question as—A, B, C & D in the booklet. The candidate has to choose the correct answer and mark the same in the OMR Answer-Sheet as per the direction :

Example :

Question :

Q. 1 (A) ● (C) (D)
Q. 2 (A) (B) ● (D)
Q. 3 (A) ● (C) (D)

Illegible answers with cutting and over-writing or half filled circle will be cancelled.

5. Each question carries equal marks. Marks will be awarded according to the number of correct answers you have.
6. All answers are to be given on OMR Answer Sheet only. Answers given anywhere other than the place specified in the answer sheet will not be considered valid.
7. Before writing anything on the OMR Answer Sheet, all the instructions given in it should be read carefully.
8. After the completion of the examination candidates should leave the examination hall only after providing their OMR Answer Sheet to the invigilator. Candidate can carry their Question Booklet.
9. There will be no negative marking.
10. Rough work, if any, should be done on the blank pages provided for the purpose in the booklet.
11. To bring and use of log-book, calculator, pager and cellular phone in examination hall is prohibited.
12. In case of any difference found in English and Hindi version of the question, the English version of the question will be held authentic.

Impt. : On opening the question booklet, first check that all the pages of the question booklet are printed properly. If there is any discrepancy in the question Booklet, then after showing it to the invigilator, get another question Booklet of the same series.

4. प्रश्न-पुस्तिका में प्रत्येक प्रश्न के चार सम्भावित उत्तर—A, B, C एवं D हैं। परीक्षार्थी को उन चारों विकल्पों में से सही उत्तर छाँटना है। उत्तर को OMR आन्सर-शीट में सम्बन्धित प्रश्न संख्या में निम्न प्रकार भरना है :

उदाहरण :

प्रश्न :

प्रश्न 1 (A) ● (C) (D)
प्रश्न 2 (A) (B) ● (D)
प्रश्न 3 (A) ● (C) (D)

अपठनीय उत्तर या ऐसे उत्तर जिन्हें काटा या बदला गया है, या गोले में आधा भरकर दिया गया, उन्हें निरस्त कर दिया जाएगा।

5. प्रत्येक प्रश्न के अंक समान हैं। आपके जितने उत्तर सही होंगे, उन्हीं के अनुसार अंक प्रदान किये जायेंगे।
6. सभी उत्तर केवल ओ. एम. आर. उत्तर-पत्रक (OMR Answer Sheet) पर ही दिये जाने हैं। उत्तर-पत्रक में निर्धारित स्थान के अलावा अन्यत्र कहीं पर दिया गया उत्तर मान्य नहीं होगा।
7. ओ. एम. आर. उत्तर-पत्रक (OMR Answer Sheet) पर कुछ भी लिखने से पूर्व उसमें दिये गये सभी अनुदेशों को सावधानीपूर्वक पढ़ लिया जाये।
8. परीक्षा समाप्ति के उपरान्त परीक्षार्थी कक्ष निरीक्षक को अपनी OMR Answer Sheet उपलब्ध कराने के बाद ही परीक्षा कक्ष से प्रस्थान करें। परीक्षार्थी अपने साथ प्रश्न-पुस्तिका ले जा सकते हैं।
9. निगेटिव मार्किंग नहीं है।
10. कोई भी रफ कार्य, प्रश्न-पुस्तिका के अन्त में, रफ-कार्य के लिए दिए खाली पेज पर ही किया जाना चाहिए।
11. परीक्षा-कक्ष में लॉग-बुक, कैलकुलेटर, पेजर तथा सेल्युलर फोन ले जाना तथा उसका उपयोग करना वर्जित है।
12. प्रश्न के हिन्दी एवं अंग्रेजी रूपान्तरण में भिन्नता होने की दशा में प्रश्न का अंग्रेजी रूपान्तरण ही मान्य होगा।

महत्वपूर्ण : प्रश्नपुस्तिका खोलने पर प्रथमतः जाँच कर देख लें कि प्रश्न-पुस्तिका के सभी पृष्ठ भलीभाँति छपे हुए हैं। यदि प्रश्नपुस्तिका में कोई कमी हो, तो कक्षनिरीक्षक को दिखाकर उसी सिरीज की दूसरी प्रश्न-पुस्तिका प्राप्त कर लें।