Subject : PHYSICS Code : 322 E Medium : English

Test Booklet Code



(Do not open this Test Booklet until you are asked to do so)

<i>Time Allowed : 60 minutes</i>	Maximum Marks : 200	Total Questions : 50	Number of questions to be answered : 40	
Kindly read the Instructions given on this Page and Back Page carefully before attempting this Question Paper.				
Important Instructi	ons for the Candia	lates :		
1. This Test Booklet contains 50 questions printed in English. Out of these, the candidate is required to answer any 40 questions. If a candidate answers more than 40 questions, the first 40 answered questions will be considered for evaluation.				
			lirected to open the Test Booklet, take blue/black ball point pen only.	
3. Use only Blue/Black B	all Point Pen for marki	ng responses.		
4. The CODE for this Test Booklet is D . Make sure that the CODE printed on the OMR Answer Sheet is the same as that on this Test Booklet. Also ensure that your Test Booklet No. and OMR Answer Sheet No. are exactly the same. In case of discrepancy, the candidate should immediately report the matter to the Invigilator for replacement of both the Test Booklet and the OMR Answer Sheet. No claim in this regard will be entertained after five minutes from the start of the examination.				
5. Before attempting the question paper kindly check that this Test Booklet has total 16 pages and OMR Answer Sheet consists of one sheet. At the start of the examination within the first five minutes, candidates are advised to ensure that all pages of Test Booklet and OMR Answer Sheet are properly printed and they are not damaged in any manner.				
			choose the MOST APPROPRIATE Answer Sheet with a Blue/Black Ball	
7. Five (5) marks will be given for each correct answer. One (1) mark will be deducted for each incorrect answer. If more than one circle is found darkened/blackened for a question, then it will be considered as an incorrect answer. Unanswered questions will be given no mark.				
Name of the Candidate (in	Capital Letters) :			
Application Number (in figures) :				
Roll Number (in figures):				
Centre of Examination (in Capital Letters) :				
Candidate's Signature :		Invigilator's Signatur	re :	
Facsimile signature stamp of Centre Superintendent :				

1. The kinetic energy of an electron in ground level in hydrogen atom is K units. The values of its potential energy and total energy respectively are ______.

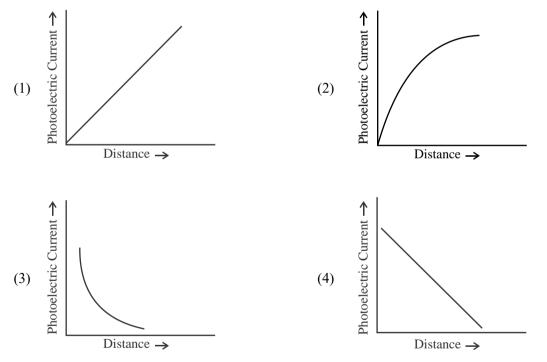
Fill in the blank with the correct answer from the options given below.

(1) -2K; -K (2) +2K; -K (3) -K, +2K (4) +K, +2K

Two nuclei have mass numbers A and B respectively. The density ratio of the nuclei is ______.
 Fill in the blank with the correct answer from the options given below.

- (1) A:B (2) $\sqrt{A}:\sqrt{B}$ (3) $A^2:B^2$ (4) 1:1
- **3.** A point source causing photoelectric emission from a metallic plate is moved away from the plate. The variation of photoelectric current with distance from the source is correctly represented by the graph

Fill in the blank with the correct answer from the options given below.



A proton accelerated through a potential difference V has a de Broglie wavelength λ. On doubling the accelerating potential, de Broglie wavelength of the proton ______.
 Fill in the blank with the correct answer from the options given below.

(1) remains unchanged

(2) becomes double

(3) becomes four times

(4) decreases

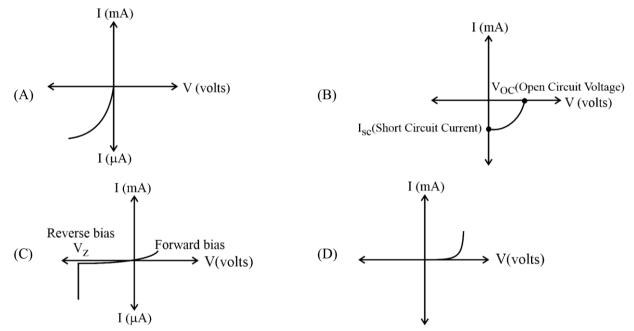
6.

- 5. The shortest wavelengths emitted in hydrogen spectrum corresponding to different spectral series are as under :
 - (A) Pfund series (B) Balmer series (C) Brackett series (D) Lyman series The wavelengths arranged correctly in decreasing order are Fill in the blank with the correct answer from the options given below. (A), (B), (C), (D) (2) (A), (C), (B), (D) (1)(3) (B), (A), (D), (C) (4) (A), (C), (D), (B) Silicon can be doped using one of the following elements as dopant : (B) Indium (A) Arsenic (C) Phosphorus (D) Boron To get n-type semiconductor, the dopants that can be used are

Fill in the blank with the correct answer from the options given below. (1) (A) and (C) only (2) (B) and (C) only

(3) (A), (B), (C) and (D) (4) (C) and (D) only

7. Given below are V versus I graphs for different types of p-n junction diodes marked A, B, C and D.

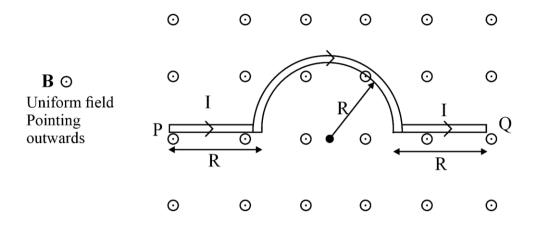


The correct sequence of graphs corresponding to forward biased p-n juction; Zener diode; Photo diode and Solar cell in order is ______

Fill in the blank with the correct answer from the options given below.

- (1) (D), (C), (A), (B) (2) (A), (C), (B), (D)
- (3) (B), (A), (D), (C) (4) (C), (B), (D), (A)

8. A wire carrying current I, bent as shown in the figure, is placed in a uniform field B that emerges normally out from the plane of the figure. The force on this wire is



Fill in the blank with the correct answer from the options given below.

- (1) 4BIR, directed vertically downward
- (2) 3BIR, directed vertically upward
- (3) BI $(2R + \pi R)$, vertically downward
- (4) 2π BIR, from P to Q
- 9. The refractive index of the material of an equilateral prism is $\sqrt{2}$. The angle of minimum deviation of that prism is _____.

Fill in the blank with the correct answer from the options given below.

- $(1) \quad 60^{\circ}$
- (2) 75°
- $(3) \quad 30^{\circ}$
- (4) 90°

322	2 E/D (5)			
10.	The transfer of integral number of is one of the evidence of quantization of electric chargFill in the blank with the correct answer from the options given below.(1) photons(2) nuclei(3) electrons(4) neutrons	e.		
11.				
	(1) 2 (2) 5 (3) 3 (4) 7			
12.	the ball if it remains just suspended in oil in an electric field of intensity 600π V/m acting in the upw direction is			
	Fill in the blank with the correct answer from the options given below. (Take $g = 10 \text{ m/s}^2$)			
	(1) 2×10^{-6} C (2) 2×10^{-5} C (3) 1×10^{-5} C (4) 1×10^{-6} C			
13.		rire		
	increases, the drift velocity of the electron in it Fill in the blank with the correct answer from the options given below.			
	(1) increases, thermal velocity of the electrons decreases			
	(1) Increases, thermal velocity of the electrons decreases(2) decreases, thermal velocity of the electrons decreases			
	(3) increases, thermal velocity of the electrons increases			
	(4) decreases, thermal velocity of the electrons increases			
14.				
	$4\Omega \mathbf{z}^{\mathbf{z}} \mathbf{z} 4\Omega$			
	JA Z			
	$4\Omega_{\mathbf{z}}\mathbf{z}^{\mathbf{z}}4\Omega$ $4\Omega_{\mathbf{z}}\mathbf{z}^{\mathbf{z}}$ $4\Omega_{\mathbf{z}}\mathbf{z}^{\mathbf{z}}$ $4\Omega_{\mathbf{z}}\mathbf{z}^{\mathbf{z}}$ $4\Omega_{\mathbf{z}}\mathbf{z}^{\mathbf{z}}$ $4\Omega_{\mathbf{z}}\mathbf{z}^{\mathbf{z}}$			
	A B			

Choose the correct answer from the options given below. (1) 9Ω (2) 18Ω (3) 4Ω (4) 14Ω

(6)

A cell of emf 1.1 V and internal resistance 0.5Ω is connected to a wire of resistance 0.5Ω . Another cell of 15. the same emf is now connected in series with the intention of increasing the current but the current in the wire remains the same. The internal resistance of the second cell is Fill in the blank with the correct answer from the options given below. (4) 2 Ω (1) 1Ω (2) 2.5Ω (3) 1.5Ω P, O, R and S are four wires of resistances 3, 3, 3 and 4 Ω respectively. They are connected to form the four 16. arms of a wheatstone bridge circuit. The resistance with which S must be shunted in order that the bridge may be balanced is . Fill in the blank with the correct answer from the options given below. (1) 14 Ω (2) 12 Ω (3) 15Ω (4) 7Ω Magnetic moment of a thin bar magnet is 'M'. If it is bent into a semicircular form, its new magnetic 17. moment will be . Fill in the blank with the correct answer from the options given below. (2) M/2 (4) $2M/\pi$ (1) M/π (3) M Ferromagnetic material used in Transformers must have 18. Fill in the blank with the correct answer from the options given below. (1) Low permeability and High Hysteresis loss (2) High permeability and Low Hysteresis loss (3) High permeability and High Hysteresis loss (4) Low permeability and Low Hysteresis loss 19. A conducting ring of radius r is placed in a varying magnetic field perpendicular to the plane of the ring. If the rate at which the magnetic field varies is x, the electric field intensity at any point of the ring is Fill in the blank with the correct answer from the options given below. (2) rx/2(3) 2rx (4) 4r/x(1) rx 20. A 50 Hz ac current of crest value 1 A flows through the primary of a transformer. If the mutual inductance between the primary and secondary be 0.5 H, the crest voltage induced in the secondary is Fill in the blank with the correct answer from the options given below. (1) 75 V (2) 150 V (3) 100 V (4) 200 V A long solenoid of diameter 0.1 m has 2×10^4 turns per meter. At the centre of the solenoid a coil of 21. 100 turns and radius 0.01 m is placed with its axis coinciding with the solenoid axis. The current in the solenoid reduces at a constant rate to 0 A from 4 A in 0.05 s. If the resistance of the coil is $10\pi^2 \Omega$, then the total charge flowing through the coil during this time is . Fill in the blank with the correct answer from the options given below. (1) 16 μC (3) 16π µC (4) $32\pi \mu C$ (2) 32 μC SPACE FOR ROUGH WORK

- 322 E/D (7)22. Lower half of a convex lens is made opaque. Which of the following statement describes the image of the object placed in front of the lens? (A) No change in image (B) Image will show only half of the object (C) Intensity of image gets reduced Choose the correct answer from the options given below. (2) (B) only (3) (C) only (4) (B) and (C) only (1) (A) only 23. Two slits are made 0.1 mm apart and the screen is placed 2 m away. The fringe separation when a light of wavelength 500 nm is used is . Fill in the blank with the correct answer from the options given below. (4) 0.1 cm (2) 0.15 cm (3) 1.5 cm (1) 1 cmFor an astronomical telescope having objective lens of focal length 10 m and evepiece lens of focal length 24. 10 cm, telescope's the tube length and magnification respectively are Fill in the blank with the correct answer from the options given below. (1) 20 cm, 1(2) 1000 cm, 1 (3) 1010 cm, 1 (4) 1010 cm, 100 25. According to Bohr's Model (A) The radius of the orbiting electron is directly proportional to 'n'. (B) The speed of the orbiting electron is directly proportional to 1/n'. (C) The magnitude of the total energy of the orbiting electron is directly proportional to $\frac{1}{n^2}$. (D) The radius of the orbiting electron is directly proportional to $'n^{2'}$. Choose the correct answer from the options given below. (1) (A), (B) and (C) only (2) (A), (B) and (D) only (4) (B), (C) and (D) only (3) (A), (B), (C) and (D) 26. For a full wave rectifier, if the input frequency is 50 Hz, the output frequency will be Fill in the blank with the correct answer from the options given below. (1) 50 Hz (2) 100 Hz (4) 0 Hz (3) 25 Hz 27. For an electric dipole in a non-uniform electric field with dipole moment parallel to direction of the field, the force F and torque τ on the dipole respectively are .
 - (1) $F = 0, \tau = 0$ (2) $F \neq 0, \tau = 0$ (3) $F = 0, \tau \neq 0$ (4) $F \neq 0, \tau \neq 0$

Fill in the blank with the correct answer from the options given below.

28. Two large plane parallel sheets shown in the figure have equal but opposite surface charge densities $+\sigma$ and $-\sigma$. A point charge q placed at points P₁, P₂ and P₃ experiences forces F₁, F₂ and F₃ respectively. Then

Choose the correct answer from the options given below.

- (1) $\vec{F}_1 = 0, \vec{F}_2 = 0, \vec{F}_3 = 0$ (2) $\vec{F}_1 = 0, \vec{F}_2 \neq 0, \vec{F}_3 = 0$ (3) $\vec{F}_1 \neq 0, \vec{F}_2 \neq 0, \vec{F}_3 \neq 0$ (4) $\vec{F}_1 = 0, \vec{F}_3 \neq 0, \vec{F}_2 = 0$
- 29. Two charged metallic spheres with radii R₁ and R₂ are brought in contact and then separated. The ratio of final charges Q₁ and Q₂ on the two spheres respectively will be _____.

Fill in the blank with the correct answer from the options given below.

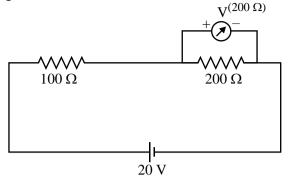
(1)
$$\frac{Q_1}{Q_2} = \frac{R_2}{R_1}$$
 (2) $\frac{Q_1}{Q_2} < \frac{R_1}{R_2}$ (3) $\frac{Q_1}{Q_2} > \frac{R_1}{R_2}$ (4) $\frac{Q_1}{Q_2} = \frac{R_1}{R_2}$

- 30. Two charged particles, placed at a distance d apart in vacuum, exert a force F on each other. Now, each of the charges is doubled. To keep the force unchanged, the distance between the charges should be changed to ______.
 Fill in the blank with the correct answer from the options given below.
- (1) 4d
 (2) 2d
 (3) d
 (4) d/2
 31. Two parallel plate capacitors of capacitances 2 μF and 3 μF are joined in series and the combination is connected to a battery of V volts. The values of potential across the two capacitors V₁ and V₂ and energy stored in the two capacitors U₁ and U₂ respectively are related as ______.
 Fill in the blank with the correct answer from the options given below.

(1)
$$\frac{V_1}{V_2} = \frac{U_1}{U_2} = \frac{3}{2}$$
 (2) $\frac{V_1}{V_2} = \frac{U_1}{U_2} = \frac{2}{3}$

(3)
$$\frac{V_1}{V_2} = \frac{3}{2}$$
 and $\frac{U_1}{U_2} = \frac{2}{3}$ (4) $\frac{V_1}{V_2} = \frac{2}{3}$ and $\frac{U_1}{U_2} = \frac{3}{2}$

32. Two resistances of 100 Ω and 200 Ω are connected in series across a 20 V battery as shown in figure below. The reading in a 200 Ω voltmeter connected across the 200 Ω resistance is



Fill in the blank with the correct answer from the options given below.

(2) $\frac{20}{3}$ V (1) 4 V (3) 10 V (4) 16 V

33. The current through a 4/3 Ω external resistance connected to a parallel combination of two cells of 2 V and 1 V emf and internal resistances of 1 Ω and 2 Ω respectively is Fill in the blank with the correct answer from the options given below.

(2) 2/3 A (1) 1 A (3) 3/4 A (4) 5/6 A

34. A metallic wire of uniform area of cross section has a resistance R, resistivity ρ and power rating P at V volts. The wire is uniformly stretched to reduce the radius to half the original radius. The values of resistance, resistivity and power rating at V volts are now denoted by R', p' and P' respectively. The corresponding values are correctly related as

Fill in the blank with the correct answer from the options given below.

(1) $\rho' = 2\rho, R' = 2R, P' = 2P$

(3)
$$\rho' = \rho, R' = 16R, P' = (1/16) P$$

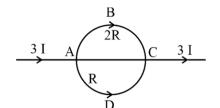
- (2) $\rho' = (1/2) \rho$, R' = (1/2) R, P' = (1/2) P(4) $\rho' = \rho, R' = (1/16) R, P' = 16P$
- 35. Three magnetic materials are listed below (A) paramagnetics (B) diamagnetics (C) ferromagnetics Choose the correct order of the materials in increasing order of magnetic susceptibility.
 - (1) (A), (B), (C) (2) (C), (A), (B) (3) (B), (A), (C) (4) (B), (C), (A)

36. Two infinitely long straight parallel conductors carrying currents I₁ and I₂ are held at a distance d apart in vacuum. The force F on a length L of one of the conductors due to the other is Fill in the blank with the correct answer from the options given below.

(1) proportional to L but independent of $I_1 \times I_2$ (2) proportional to $I_1 \times I_2$ but independent of length L

(4) proportional to $\frac{L}{I_1 \times I_2}$ (3) proportional to $I_1 \times I_2 \times L$

In the circuit shown below, a current 3 I enters at A. The semicircular parts ABC and ADC have equal radii 37. 'r' but resistances 2R and R respectively. The magnetic field at the center of the circular loop ABCD is

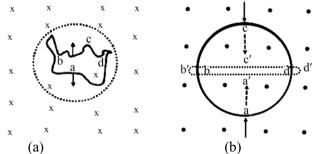


Fill in the blank with the correct answer from the options given below. (1) $\frac{\mu_0 I}{4r}$ out of the plane (2) $\frac{\mu_0 I}{4r}$ into the plane (4) $\frac{\mu_0 3I}{4r}$ into the plane (3) $\frac{\mu_0 3I}{4r}$ out of the plane

A square loop with each side 1 cm, carrying a current of 10 A, is placed in a magnetic field of 0.2 T. The 38. direction of magnetic field is parallel to the plane of the loop. The torque experienced by the loop is Fill in the blank with the correct answer from the options given below. (1) zero (2) 2×10^{-4} Nm (3) 2×10^{-2} Nm (4) 2 Nm

In an ac circuit, the current leads the voltage by $\pi/2$. The circuit is 39. Fill in the blank with the correct answer from the options given below.

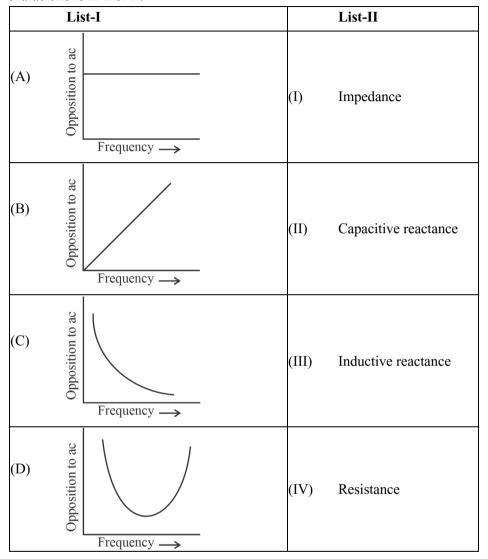
- (1) purely resistive (2) should have circuit elements with resistance equal to reactance.
- (3) purely inductive (4) purely capacitive
- 40. In a pair of adjacent coils, for a change of current in one of the coils from 0 A to 10 A in 0.25 s, the magnetic flux in the adjacent coil changes by 15 Wb. The mutual indutance of the coils is Fill in the blank with the correct answer from the options given below.
 - (1) 120 H (2) 12 H (3) 1.5 H (4) 0.75 H
- A wire of irregular shape in figure (a) and a circular loop of wire in figure (b) are placed in different 41. uniform magnetic fields as shown in the figures below. In figure (a), the magnetic field is perpendicular into the plane. In figure (b), the magnetic field is perpendicular out of the plane.



The wire in figure (a) is turning into a circular loop and that in figure (b) into a narrow straight wire. The direction of induced current will be

- Fill in the blank with the correct answer from the options given below.
- clockwise in both (a) and (b) (2) anticlockwise in both (a) and (b) (1)
- (3) clockwise in (a) and anticlockwise in (b) (4) anticlockwise in (a) and clockwise in (b)

Match List-I has four graphs showing variation of opposition to flow of ac versus frequency with circuit 42. characteristic in List-II.



Choose the correct answer from the options given below.

- (1) (A) - (I), (B) - (II), (C) - (III), (D) - (IV) (2) (A) - (IV), (B) - (III), (C) - (II), (D) - (I)
- (A) (I), (B) (II), (C) (IV), (D) (III) (4) (A) (III), (B) (IV), (C) (I), (D) (II) (3)

In an electromagnetic wave, the ratio of energy densities of electric and magnetic fields is _____ 43. Fill in the blank with the correct answer from the options given below.

(4) $1:c^2$ (1) 1:1(2) 1 : c (3) c:1

(12)

44. Of the following, the correct arrangement of electromagnetic spectrum in decreasing order of wavelength is

Fill in the blank with the correct answer from the options given below.

- (1) Radio waves, X-rays, Infrared waves, microwaves, visible waves
- (2) Infrared waves, microwaves, Radio waves, X-rays, visible waves
- (3) Radio waves, microwaves, Infrared waves, visible waves, X-rays
- (4) X-rays, visible waves, Infrared waves, microwaves, Radio waves
- 45. Match Electromagnetic waves listed in column I with Production method/device in column II.

Column-I			Column-II
	Electromagnetic waves		Production method/device
(A)	Microwaves	(I)	LC oscillator
(B)	Infrared	(II)	Magnetron
(C)	X-rays	(III)	Vibration of atoms/molecules
(D)	Radio waves	(IV)	Bombarding large atomic number metal target with fast moving electrons

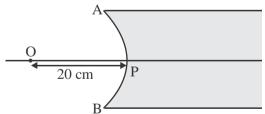
The correctly matched combination is as in option :

	(1)	(A) - (I), (B) - (II), (C) - (III), (D) - (IV)
--	-----	------------------------------------------------

(3) (A) - (II), (B) - (I), (C) - (IV), (D) - (III)

(2) (A) - (II), (B) - (III), (C) - (IV), (D) - (I)
(4) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

46. In the figure given below, APB is a curved surface of radius of curvature 10 cm separating air and a transparent material ($\mu = 4/3$). A point object O is placed in air on the principal axis of the surface 20 cm from P. The distance of the image of O from P will be ______.



Fill in the blank with the correct answer from the options given below.

(1) 16 cm left of P in air

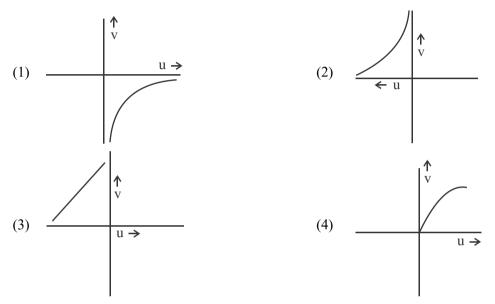
(2) 16 cm right of P in water

(3) 20 cm right of P in water

(4) 20 cm left of P in air

- 47. For fixed values of radii of curvature of lens, power of the lens will be
 - Fill in the blank with the correct answer from the options given below.
 - (1) $P \propto (\mu 1)$ (2) $P \propto \mu^2$ (3) $P \propto 1/\mu$ (4) $P \propto \mu^{-2}$
- **48.** The graph correctly representing the variation of image distance 'v' for a convex lens of focal length 'f versus object distance 'u' is ______.

Fill in the blank with the correct answer from the options given below.



49. Using light from a monochromatic source to study diffraction in a single slit of width 0.1 mm, the linear width of central maxima is measured to be 5 mm on a screen held 50 cm away. The wavelength of light used is ______.

Fill in the blank with the correct answer from the options given below.

(1) $2.5 \times 10^{-7} \text{ m}$ (3) $5 \times 10^{-7} \text{ m}$ (4) $7.5 \times 10^{-7} \text{ m}$

50. Radiation of frequency $2v_0$ is incident on a metal with threshold frequency v_0 . The correct statement of the following is _____.

Fill in the blank with the correct answer from the options given below.

- (1) No photoelectrons will be emitted
- (2) All photoelectrons emitted will have kinetic energy equal to hv_0
- (3) Maximum kinetic energy of photoelectrons emitted can be hv_0
- (4) Maximum kinetic energy of photoelectrons emitted will be $2hv_0$

(14)

(15)

Read carefully the following instructions :

- 8. No candidate will be allowed to leave the OMR Answer Sheet blank. If any OMR Answer Sheet is found blank, it shall be crossed by the Invigilator with his/her signature, mentioning "Cancelled" on it.
- 9. Do not tear or fold any page of the Test Booklet and OMR Answer Sheet.
- 10. Candidates are advised to ensure that they fill the correct particulars on the OMR Answer Sheet, i.e., Application No., Roll No., Test Booklet No., Name, Mother's Name, Father's Name and Signature.
- 11. Rough work is to be done in the space provided for this purpose in the Test Booklet only.
- 12. The answers will be evaluated through electronic scanning process. Incomplete or incorrect entries may render the OMR Answer Sheet invalid.
- 13. Candidates are advised not to fold or make any stray marks on the OMR Answer Sheet. Use of Eraser, Nail, Blade, White Fluid/Whitener, etc., to smudge, scratch or damage in any manner the OMR Answer Sheet during examination is strictly prohibited. Candidature and OMR Answer Sheet of candidates using Eraser, Nail, Blade or White Fluid/Whitener to smudge, scratch or damage in any manner shall be cancelled.
- 14. There will be one copy of OMR Answer Sheet i.e., the Original Copy. After the examination is over, the candidate shall hand over the OMR Answer Sheet to the Invigilator. The candidate can take away the Test Booklet after the examination is over. If the candidate does not hand over the OMR Answer Sheet to the Invigilator and goes away with the OMR Answer Sheet, his/her candidature shall be cancelled and criminal proceedings shall also be initiated against him/her.
- 15. Candidates are advised strictly not to carry handkerchief, any mobile phone, any type of watch, belt or wear ornaments like ring, chain, ear-ring, etc., electronic or communication device, pen, pencil, eraser, sharpener and correction fluid to the Examination Centre. If any candidate is found possessing any such item, he/she will not be allowed to enter the examination centre. Possession of a mobile phone or any other aiding material as mentioned above by the candidate in the examination room will be treated as a serious violation and it may lead to cancellation of the candidature and debarring him/her from future examinations.
- 16. If a candidate violates any instructions or shows any indiscipline or misbehaviour, appropriate action will be taken including cancellation of candidature and debarring from future examinations.
- 17. Use of electronic/manual calculator is **not** allowed.