राष्ट्रीय प्रौद्योगिकी संस्थान दिल्ली
NATIONAL INSTITUTE OF TECHNOLOGY DELHI
(शिक्षा मंत्रालय, भारत सरकार के अधीन एक स्वायत्त संस्थान)

(An autonomous Institute under the aegis of Ministry of Education (Shiksha Mantralaya), Govt. of India)

Plot No. FA7, Zone P1, GT Karnal Road, Delhi-110036, INDIA

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NOTICE

Advt. No. 08/ 2024: Answer Key and Representations Invited for the Domain

Knowledge Tests held on 18.02.2025

Position	Applied Sciences (Physics): Assistant Professor Grade I (Pay Level 12)
Date	18.02.2025 (Tuesday)
Examination Time	4:00 PM – 5:00 PM

Following is the attached answer key. If any appeared candidate for the domain knowledge test has any representations against the questions, may submit by filling up the following Google Form **on or before 21.02.2025 11:59 PM**. After that no representations will be considered.

Google Form Link:
https://docs.google.com/forms/d/e/1FAIpQLSdSL0LirlHEwHuM5H3WDc2ls6hztZlKe_SeUZG1XVxWfACQ7Q/viewform?usp=preview

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QUESTION PAPER FOR THE POST OF ASSISTANT PROFESSOR PHYSICS
(PAY LEVEL 12)

Maximum Marks: 50   **Time: 60 Minutes**

Name of Candidate: _____ **Roll No:** _____

INSTRUCTIONS TO CANDIDATES

1. This question paper has 50 questions. Each question carries one mark. There are four choices for answer (A, B, C, D) to each question. Choose the correct answer (one only) for each question and write the answer in the space provided against each question.
2. Candidate must write Name, Roll No. and sign on each page of this booklet.
3. The candidate should check that the booklet does not have any unprinted or torn or missing pages or questions etc. If so, get it replaced with another question paper, before question paper starts.
4. One (1) mark will be awarded for each correct answer. There will be negative marking and (-¼) mark will be awarded for each incorrect answer.
5. The unanswered questions will not attract negative marking
6. Return the Question Paper cum Answer Sheet to the invigilator after the examination is over.
7. **Mobile, Electronic Watch** and other **Electronic Gadgets** are prohibited in the examination.
8. There should not be any cutting or overwriting in the Answer.
9. Use of Unfair Means in Examination will lead to cancellation of candidature.

अभ्यर्थियों के लिए अनुदेश

1. इस प्रश्न पत्र में 50 प्रश्न हैं. प्रत्येक प्रश्न एक अंक का है। प्रत्येक प्रश्न के उत्तर के लिए चार विकल्प (A, B, C, D) हैं। प्रत्येक प्रश्न के लिए सही उत्तर (केवल एक) चुनें और प्रत्येक प्रश्न के सामने दिए गए स्थान पर उत्तर लिखें।
2. अभ्यर्थी को इस पुस्तिका के प्रत्येक पृष्ठ पर अपना नाम, रोल नंबर लिखना होगा तथा हस्ताक्षर करना होगा।
3. अभ्यर्थी को यह जांचना चाहिए कि पुस्तिका में कोई भी बिना छपा हुआ या फटा हुआ या गायब पृष्ठ या प्रश्न आदि नहीं है। यदि ऐसा है, तो प्रश्न पत्र शुरू होने से पहले इसे दूसरे प्रश्न पत्र से बदल लें।
4. प्रत्येक सही उत्तर के लिए एक (1) अंक दिया जाएगा। नकारात्मक अंकन होगा और प्रत्येक गलत उत्तर के लिए (- ¼) अंक दिया जाएगा।
5. अनुत्तरित प्रश्न नकारात्मक अंकन को आकर्षित नहीं करेंगे
6. परीक्षा समाप्त होने के बाद प्रश्न पत्र सह उत्तर पुस्तिका पर्यवेक्षक को लौटा दें।
7. मोबाइल, इलेक्ट्रॉनिक घड़ी और अन्य इलेक्ट्रॉनिक गैजेट्स परीक्षा में वर्जित हैं.
8. उत्तर में कोई कटिंग या ओवरराइटिंग नहीं होनी चाहिए।

Q. No.	Question
1	For repulsive inverse square forces the shape of orbit (A) Elliptic (B) Parabolic (C) Hyperbolic (D) Linear Hyperbolic
2	The electric field intensity on the surface of a charged conductor is (A) Zero (B) Directed normally to the surface (C) Directed tangentially to the surface (D) Directed along 45^0 to the surface
3	The amplitude of electric and magnetic fields are related to each other by the relation. (A) $E_0 B_0 = C$ (B) $B_0 = E_0 C$ (C) $E_0 = B_0 C$ (D) $B_0 E_0 = C^2$
4	The displacement current arises due to (A) Positive charges only (B) Negative charges only (C) Both Positive and Negative charges (D) Time varying electric field
5	Displacement current can be represented as (A) $i_d = \mu_0 \dfrac{d\phi_F}{dt}$ (B) $i_d = \epsilon_0 \dfrac{d\phi_E}{dt}$ (C) $i_d = \mu_0 \dfrac{d\phi_\beta}{dt}$ (D) $i_d = \epsilon_0 \dfrac{d\phi_\beta}{dt}$
6	Which of the following is not used as a moderator in a nuclear reactor (A) H_2O (B) D_2O (C) C (D) Al
7	A stone is thrown upwards with initial velocity of 20 m/ s , the height that stone will reach would be (A) 20 m (B) 30 m (C) 40 m (D) 50 m

8	Primary cosmic rays are composed of very energetic- (A) Electrons (B) Mesons (C) Protons (D) Neutrons
9	Horizontal distance travelled by a ball if it's thrown with initial velocity of 20 m/s at an angle of 30° is (A) 24 m (B) 56 m (C) 35.3 m (D) 36.3 m
10	A rectangle-shaped open-to-sky tank of water has a length of 2 m and a width of 1 m. If the atmospheric pressure is assumed to be 100 kPa and thickness of the tank walls is assumed to be negligible, the force exerted by the atmosphere on the surface of water is (A) 20 kN (B) 50 kN (C) 100 kN (D) 200 kN
11	If $E_2 = iE_1$, than the electromagnetic wave is (A) Plane Polarized (B) Circularly polarized (C) Elliptically polarized (D) Unpolarized
12	Davission and Germar experiments relates to – (A) Interference (B) Polarization (C) Electron diffraction (D) Phosphorene
13	The duration of a radar pulse is 10^{-6} s. The uncertainty in its energy would be (A) 0 (B) 1.05×10^{-35}J (C) 1.05×10^{-28}J (D) 1.05×10^{-21}J
14	The zero point energy of a harmonic oscillator (A) $h\omega$ (B) $\frac{1}{2} h\omega$ (C) $2h\omega$ (D) $\frac{1}{4} h\omega$
15	Projectile will attain its maximum range, if it is fired at an angle of (A) 30° (B) 47° (C) 90° (D) 45°

16	Speed of sound in water is 1500 m s -1 , depth of water when reflected sound waves are detected after 0.40 s is (A) 700 m (B) 600 km (C) 600 m (D) 750 km
17	All vibration producing a charge in the electric dipole moment of a molecule yield- (A) Raman Spectra (B) Infrared spectra (C) Ultra-violet Spectra (D) X-ray Spectra
18	The continuous X-ray spectrum is the result of the – (A) Photo electric effects (B) Inverse photo electric effect (C) Compton effect (D) Auger effect
19	A person of mass 'm' kg jumps from a height of 'h' meters, he will land on the ground with a velocity equal to: (A) $\sqrt{2 \times g \times h}$ (B) $1/h \times \sqrt{2 \times g}$ (C) $2gh$ (D) $2\sqrt{g \times h}$
20	In a Ruby Laser Population inversion is achieved by applying- (A) Magnetic field (B) Electric field (C) Both magnetic and electrostatic field (D) Optical pumping
21	Each R-C network in the phase shift oscillator induces a phase change (A) 360^0 (B) 90^0 (C) 60^0 (D) 180^0
22	Three resistances 20 Ω, 30 Ω and 60 Ω are connected in parallel, their combined resistance is given by (A) 10 Ω (B) 50 Ω (C) 20 Ω (D) 100 Ω
23	Our eyes detect the oscillations up to (A)3 Hz (B) 5 Hz (C) 7 Hz (D) 9 Hz

24	Increase in kinetic energy of car having mass 800 kg and velocities ranging from 20 m s-1 to 30 m s-1 is (A) 200 KJ (B) 300 KJ (C) 400 KJ (D) 500 KJ
25	Total capacitance of 300 mF capacitor and a 600 mF in series is (A) 300 mF (B) 500 mF (C) 200 mF (D) 1000 mF
26	For electromagnetic wave refraction, Brewester's law is given by (assume $n_2 > n_1$) (A) $\phi_p = \sin^{-1}(n_2/n_1)$ (B) $\phi_p = \cos^{-1}(n_2/n_1)$ (C) $\phi_p = \tan^{-1}(n_2/n_1)$ (D) $\phi_p = \sin^{-1}(n_1/n_2)$
27	The electric field intensity E due to an infinite uniformly charged plane sheet at a point distance r from the sheet in related as – (A) $E \propto r$ (B) $E \propto r^{-1}$ (C) $E \propto r^{-2}$ (D) E is independent of r
28	The electric field inside a conducting material of radius R is – (A) $q/4\pi\epsilon_0 r^2$ (B) Zero (C) $q/4\pi\epsilon_0 R^2$ (D) None of these
29	A cube of side 'a' is placed in a uniform electric field $E = iE_0$ The total electric flux through the cube is – (A) Zero (B) $2a^2 E_0$ (C) $4a^2 E_0$ (D) $6a^2 E_0$
30	Eight electric dipoles of charges of magnitude are placed inside a cube. The total electric flux coming out of the cube will be- (A) $8e/\epsilon_0$ (B) $16e/\epsilon_0$ (C) e/ϵ_0 (D) Zero
31	The drift velocity of electrons in a metal is the order of – (A) 10^5 m/s (B) 0.1 mm/s (C) 10m/s (D) Zero

32	The vector potential at the position defined by vector r in a uniform magnetic field may be written as – (A) B x r (B) ½ (B x r) (C) B . r (D) – (B . r)
33	If n is the polarized vector and k is the direction of propagation of a plane electromagnetic wave than- (A) n = k (B) n = - k (C) n.k = 0 (D) n x k = 0
34	The electric vector E and magnetic vector H inside a conductor- (A) Remains in phase (B) Never in phase (C) Phase depends on conducting medium (D) None of these
35	The potential which exhibit the dependence of the potentials on the velocity of particles is known as – (A) Scalar potentials (B) Vector potentials (C) Lienard-Wiechert Potentials (D) Retarded potentials
36	The path of the particles for a motion in a uniform electric field is – (A) Parallel (B) Perpendicular (C) Parabola (D) Circular
37	A solid sphere of radius R carries a uniform volume charge density ρ. The magnitude of electric field inside the sphere at a distance r from the centre is - (A) $r\rho /3\epsilon_0$ (B) $R\rho/3\epsilon_0$ (C) $R^2\rho/r\epsilon_0$ D) $R^3\rho/r^2\epsilon_0$
38	The capacitance per unit length and the characteristic impedance of a lossless transmission line are C and Z_0 respectively. The velocity of a travelling wave on the transmission line is – (A) Z_0C (B) $1/ Z_0C$ (C) Z_0/C (D) C/ Z_0
39	Mean drift velocity of electron in a copper wire having cross-sectional area 5.0×10^{-6} m2 carrying current of 1 A and having number density 8.5×10^{28} m3 is (A) 0.015 mm s-1 (B) 0.1 mm s-1 (C) 0.5 mm s-1 (D) 0.25 mm s-1

40	One Bohr magnetron is approximately (A) $10^{23} Am^2$ (B) $10^{-23} Am^2$ (C) $10^{10} Am^2$ (D) $10^{-10} Am^2$
41	Energy stored in a 2000 mF capacitor charged to a potential difference of 10 V is (A) 0.12 J (B) 1.3 J (C) 0.10 J (D) 3 J
42	The de-Broglie wavelength associated with neutron in thermal equilibrium with matter at 300K (A) $1790A^0$ (B) $179A^0$ (C) $17.9A^0$ (D) $1.79A^0$
43	Kirchhoff's 2nd law is consequence of law of conservation of A. energy B. charge C. momentum D. power
44	The emitter current is always – (A) Greater than the base current (B) Less than the collector current (C) Greater than the collector current (D) Both (A) & (C)
45	The mobility of an election in a conductor is expressed in terms of – (A) cm^2/V-s (B) cm/V-s (C) cm^2/V (D) cm^2/s
46	If $\alpha = 0.98$, $I_{co} = 6\mu A$, $I_\beta = 100 \mu A$ for a transistor, than the value of I_c will be (A) 2.3mA (B) 3.1mA (C) 4.6mA (D) 5.2mA
47	Kirchhoff,s voltage law is satisfied in – (A) Linear circuits (B) Non-linear circuits (C) Both linear and non-linear circuits (D) None of these

48	Photoelectric absorption take place when a sufficiently energetic photon interacts with a (A) Free electron (B) Electron of outermost shell (C) Nucleus (D) K-Shell electron
49	When a substance is melted, it's temperature doesn't rise because (A) energy is lost somewhere (B) energy is used to break the bonds (C) energy is used to make bonds (D) energy is absorbed to make bonds
50	Dimensions of Young's modulus are (A) $[M]^{-1}[L]^{-1}[T]^{-2}$ (B.) $[M]^{-1}[L]^{-2}[T]^{-2}$ (C) $[M][L]^{-2}[T]^{-2}$ (D) $[M][L]^{-1}[T]^{-2}$

Answer Key

Q. No.	Answer	Q. No.	Answer	Q. No.	Answer
1	C	21	C	41	C
2	D	22	A	42	D
3	C	23	B	43	A
4	D	24	A	44	D
5	B	25	D	45	B
6	D	26	C	46	D
7	A	27	D	47	C
8	C	28	B	48	D
9	A	29	A	49	B
10	D	30	D	50	D
11	B	31	B		
12	C	32	B		
13	C	33	C		
14	B	34	B		
15	D	35	C		
16	A	36	C		
17	B	37	A		
18	B	38	B		
19	A	39	A		
20	D	40	B		