TEST SERIES FOR GATE

BOOKLET SERIES C

Paper Code: PH

Test Type: TEST SERIES

Duration: 3:00 Hours

PHYSICS

Date: 19-01-2016

Maximum Marks: 100

Read the following instructions carefully:

1. Attempt all the questions.
2. This question paper consists of **2 sections**, General Aptitude (GA) for **15 marks** and the subject specific GATE paper for **85 marks**. Both these sections are compulsory. The GA section consists of **10** questions. Question numbers 1 to 5 are of 1-mark each, while question numbers 6 to 10 are of 2-mark each. The subject specific GATE paper section consists of **55** questions, out of which question numbers 11 to 35 are of 1-mark each, while question numbers 36 to 65 are of 2-mark each.
3. The question paper may consist of questions of **multiple choice type** (MCQ) and **numerical answer type**.
4. Multiple choice type questions will have four choices against (a), (b), (c), (d), out of which only **ONE** is the correct answer.
5. For numerical answer type questions, each question will have a numerical answer and there will not be any choices.
6. All questions that are not attempted will result in zero marks. However, wrong answers for multiple choice type questions (MCQ) will result in **NEGATIVE** marks. For all MCQ questions a wrong answer will result in deduction of ⅓ marks for a **1-mark** question and ⅔ marks for a **2-mark** question.
7. There is **NO NEGATIVE MARKING** for questions of **NUMERICAL ANSWER TYPE**.
8. Non-programmable type Calculator is allowed.

CAREER ENDEAVOUR
ACADEMY PRIVATE LIMITED

South Delhi Centre: 28-A/11, Jia Sarai, Near-IIT, Hauz Khas, New Delhi-16
T : 011-26851008, 26861009

North Delhi Centre: 33-35, First Floor, Mall Road, G.T.B. Nagar (Opp. Metro Gate No.3), Delhi-09
T : 011-65462244, 65662255
E: info@careerendeavour.com W: careerendeavour.com

Q.1-Q. 5 carry ONE mark each.

1. Which is the correct form of incorrect sentence: The speed of this car is greater than the old one.
   (a) Correct: The speed of this car is greater than that a old one
   (b) Correct: The speed of this car is greater than that the old one
   (c) Correct: The speed of this car is greater than that old one
   (d) Correct: The speed of this car is greater than that of old one
2. Which is the correct form of incorrect sentence: Neither his brother nor any member of the family helped him.
   (a) Correct: Neither his brother nor other member of the family helped him.
   (b) Correct: Neither his brother nor any other member of the family helped him.
   (c) Correct: Neither his brother nor any member of the family helped him.
   (d) Correct: Neither his brother or any other member of the family helped him.
3. Two numbers X and Y are 20% and 28% less than a third number Z. Find by what percentage is the number Y less than the number X?
   (a) 8% (b) 12% (c) 10% (d) 9%
4. What is antonyms of word advent?
   (a) Arrival (b) Runaway (c) Departure (d) discover
5. What is synonym of word skirmish?
   (a) Minor fight (b) discussion (c) killing (d) high expectation

Q.6-Q. 10 carry TWO marks each.

6. Find the remainder in expression of $73\times75\times78\times57\times197$ when it is divisible by 34.
   (a) 28 (b) 29 (c) 30 (d) 31
7. In a village, $\frac{5}{8}$ of the population are adults $\frac{1}{2}$ of the adults are male $\frac{4}{5}$ of adult females are illiterate.
   If 400 females are illiterate then the population of the village is:
   (a) 2000 (b) 1500 (c) 1800 (d) 1600
8. A two digit number becomes five sixth of itself when its digit are reversed the two digits differ by one then number is:
   (a) 24 (b) 45 (c) 56 (d) 54
9. Two trains 180 and 220 metres long are running in opposite directions at 40 and 50 km/h respectively. They cross each other in
   (a) 16 s (b) 17 s (c) 18 s (d) 22 s
10. Skeleton: Body::Grammar:?
    (a) Language (b) Sentence (c) Meaning (d) Education

Q.11-Q.35 carry one mark each.

11. Let U, T, S and P denote, respectively, the internal energy, temperature, entropy and pressure of a thermodynamic system. Then a change ΔF in the free energy F = U – TS measures.
    (a) the heat exchanged at constant pressure
    (b) the work done by the system at constant entropy
    (c) the work done on the system at constant temperature
    (d) the heat exchanged at constant temperature.
12. A rigid triangular molecule consists of three non-collinear atoms joined by rigid rods. The constant pressure molar specific heat at constant pressure of an ideal gas consisting of such molecules is
    (a) $6R$ (b) $5R$ (c) $4R$ (d) $3R$

13. An ideal gas undergoes an isothermal change of volume. The initial and final volumes are given to be 1.0 litre and 2.7 litres respectively. If in this process the entropy per mole changes from S_1 to S_2. The value of differences $S_2 - S_1$ is nearest to ..... R. (R is the universal gas constant).

14. Suppose $f(t)$ is skew-symmetric periodic function of *t*, then the fourier series of the function $f(t)$ will be of the form

(a) $f(t) = A_0 + \sum_{n=1}^{\infty} A_n \cos(n\omega t) + B_n \sin(n\omega t)$ (b) $f(t) = A_0 + \sum_{n=1}^{\infty} A_n \cos(n\omega t)$

(c) $f(t) = \sum_{n=1}^{\infty} B_n \sin(n\omega t)$ (d) $f(t) = A_0 + \sum_{n=1}^{\infty} B_n \sin(n\omega t)$

15. The solution of the following differential equation:

$$\frac{d^2 f}{dx^2} + \frac{df}{dx} - 6f = 0$$

subjected to the initial conditions $f(0) = 1, f'(0) = 0$, is

(a) $\frac{3}{5}e^{2x} + \frac{2}{5}e^{-3x}$ (b) $\frac{2}{5}e^{2x} + \frac{3}{5}e^{-3x}$ (c) $\frac{1}{5}e^{4x} + \frac{4}{5}e^{-x}$ (d) $\frac{1}{5}e^{4x} - \frac{4}{5}e^{x}$

16. The residue of the complex function $f(z) = \frac{1}{(z-1)^2(z-3)}$ at $z = 1$ is .....

17. Which one of the following commutation relations is **NOT CORRECT**? (Symbols have usual meanings)

(a) $\left[\hat{L}^2, \hat{L}_y\right] = 0$ (b) $\left[\hat{L}_z, \hat{L}_y\right] = -i\hbar\hat{L}_x$ (c) $\left[\hat{L}_z, \hat{L}_+\right] = -\hbar\hat{L}_+$ (d) $\left[\hat{L}_z, \hat{L}_-\right] = -\hbar\hat{L}_-$

18. An atomic state of hydrogen is represented by the following wavefunction:

$$\psi(r, \theta, \varphi) = \frac{1}{162\sqrt{\pi}a_0^{7/2}} r^2 e^{-\frac{r}{3a_0}} \sin^2\theta\, e^{i2\varphi}$$

where a_0 is the first Bohr radius. The quantum numbers of the state are

(a) $n = 3, l = 2, m = 2$ (b) $n = 3, l = 2, m = -2$ (c) $n = 2, l = 1, m = 1$ (d) $n = 2, l = 1, m = -1$

19. Consider a particle of mass *m* is moving under the following 2-D potential:

$$V(x, y) = \frac{1}{2}m\omega^2(x^2 + 9y^2)$$

The state of the particle with energy $5\hbar\omega$ is *g*-fold degenerate. The value of *g* is .....

20. The degeneracy of the spectral term ^3D is .....

21. The far infrared rotational absorption spectrum of diatomic molecule shows equidistant blines with spacing 15 cm^{-1}. The position of the second stokes line in the rotational Raman spectrum of the molecule is

(a) 30 cm^{-1} (b) 60 cm^{-1} (c) 75 cm^{-1} (d) 90 cm^{-1}

22. The central wavelength of a 0.6 μm wavelength laser corresponds to the m^{th} cavity mode of a resonator cavity of length 6 cm. The mode number m is

(a) 1000 (b) 2×10^4 (c) 2×10^5 (d) 200

23. Suppose a charge Q is distributed within a sphere of radius R in such a way that the charge density $\rho(r)$ at a distance *r* from the centre of the sphere is

$$\rho(r) = \begin{cases} \frac{3Q}{\pi R^n}(R-r) & for\ 0 < r < R \\ 0 & for\ r > R \end{cases}$$

The value of n is .....

24. The electric field due to an electric quadrupole varies with distance *r* as

(a) $\frac{1}{r^2}$ (b) $\frac{1}{r^4}$ (c) $\frac{1}{r^3}$ (d) none of these

25. The current passing through a choke coil of 1 H is decreasing at the rate of 2A/sec. Then, the emf developed in the coil is ..... V.

26. A uniform circular disc of mass M and radius R has moment of inertia $\frac{3MR^2}{4}$ about a chord of the disc. Distance of the chord from the center of the disc is:

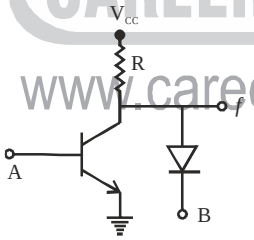
(a) $\frac{R}{2}$ (b) $\frac{R}{3}$ (c) $\frac{R}{\sqrt{2}}$ (d) $\frac{R}{2\sqrt{2}}$

27. A particle is moving along a curve with constant speed v_0. If equation of the curve is $r = 2e^{\theta/2}$ then radial acceleration of the particle is

(a) $-\frac{v_0^2}{5r}$ (b) $-\frac{4v_0^2}{5r}$ (c) $-\frac{3v_0^2}{5r}$ (d) $-\frac{5v_0^2}{4r}$

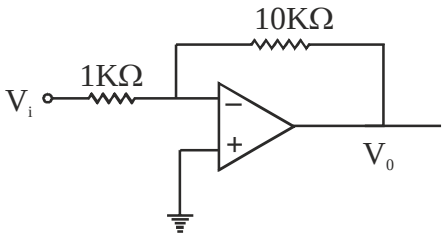
28. Two hollow spheres of radii R_A and R_B roll down an inclined plane starting from rest. If $\frac{R_A}{R_B} = 2$ then ratio of time taken by the two to reach bottom of the incline t_A/t_B is .....

29. For the given transistor circuit shown below the output expression *f* is



(a) $\bar{A} + B$ (b) $\bar{A}B$ (c) $\bar{A} + \bar{B}$ (d) $\bar{A}\bar{B}$

30. An op-amp having open loop voltage gain 10 shown in the figure. The closed loop voltage gain is .....



31. The ratio of nearest neighbour distance of SC crystal to FCC is .....

32. Magnetic dipole moment of deuteron is ..... (in the units of μ_N, where μ_N is nuclear magneton).

33. In the Bethe-Weizsäcker semi-empirical mass formula the coulomb repulsion term is

(a) $-\frac{3}{5}\left(\frac{e^2}{4\pi\varepsilon_0}\right)\frac{z^2}{A^{1/3}}$ (b) $-\frac{3}{5}\left(\frac{e^2}{4\pi\varepsilon_0}\right)\frac{z(z-1)}{A^{1/3}}$

(c) $\left(\frac{e^2}{8\pi\varepsilon_0}\ \frac{z^2}{A^{1/3}}\right)\times 10^{15}$ (d) $\left(\frac{e^2}{8\pi\varepsilon_0}\ \frac{z(z-1)}{A^{1/3}}\right)\times 10^{15}$

34. X-rays of 10 keV energy are used to determine the crystal lattice structure of fcc solid. The lattice constant of solid is a = 1.24Å. The angle of diffraction for (111) plane is ..... degree.

35. An electron beam accelerated through a potential of 300 volt. The radius of Ewald sphere in reciprocal space is (in $Å^{-1}$)

(a) $2\sqrt{2}\,\pi$ (b) $\frac{\pi}{\sqrt{2}}$ (c) 2π (d) π

Q.36-Q.65 carry TWO marks each.

36. Two thermally isolated identical systems have heat capacities which vary as $C_V = \beta T^3$ (where $\beta > 0$). Initially one system is at 300K and the other at 400 K. The systems are then brought into thermal contact and the combined system is allowed to reach thermal equilibrium. The final temperature of the combined system is .....

37. A system consists of *N* number of particles, $N >> 1$. Each particle can have only one of the two energies E_1 or $E_1 + \varepsilon(\varepsilon > 0)$. If the system is in equilibrium at a temperature *T*, the average number of particles with energy E_1 is

(a) $\frac{N}{2}$ (b) $\frac{N}{e^{\varepsilon/kT}+1}$ (c) $\frac{N}{e^{-\varepsilon/kT}+1}$ (d) $Ne^{-\varepsilon/kT}$

38. A system comprises of three electrons. There are three single particle energy levels accessible to each of these electrons. The number of possible configurtions for this system is

(a) 1 (b) 3 (c) 6 (d) 7

39. The equation of state of an ideal gas is $p = nk_BT$, where 'p' is the thermodynamic pressure and $n = N/V$ is the thermodynamic variable for the number of particle per unit volume. The 'n' dependence of the free energy '*f*' per unit volume of the ideal gas is obtained by the following expression, where C_T is temperature-dependent constant.

(a) $nk_BT[\ln n + C_T]$ (b) $2nk_BT[n\ln n + C_T]$ (c) $\frac{3}{2}nk_BT$ (d) $3nk_BT$

40. Given: $\vec{A} = \vec{r}\times\vec{F}$, where $\vec{F} = F_0\left(\hat{i}+\hat{j}-\hat{k}\right)$ is a constant vector and $\vec{r}$ is the position vector. The value of the integral $\oint_C \vec{A}.d\vec{r}$, where *C* is a closed curve defined by $9x^2 + 4y^2 = 36$, is

(a) 0 (b) $12\pi F_0$ (c) $-12\pi F_0$ (d) $6\pi F_0$

41. Suppose λ_1, λ_2 and λ_3 are the eigenvalues of the following matrix:

$$\begin{bmatrix} 1 & -3 & 3 \\ 3 & -5 & 3 \\ 6 & -6 & 4 \end{bmatrix}$$

Then the value of $\lambda_1\lambda_2 + \lambda_2\lambda_3 + \lambda_3\lambda_1$ is .....

42. Which of the following statement is **NOT CORRECT** about Laplace transform?

(a) $f(t) = e^{2t}t^2, L[f(t)] = \dfrac{2}{(s-2)^3}$ (b) $f(t) = e^{3t}\cos 2t, L[f(t)] = \dfrac{(s-3)}{(s-3)^2+4}$

(c) $f(t) = \delta(t), L[f(t)] = 1$ (d) $f(t) = 1 \quad \text{for } t \geq 1$; $= 0 \quad \text{for } t < 1$, $L[f(t)] = \dfrac{1}{s}$

43. An unperturbed two level system has energy eigenvalues E_{ground} and $E_{excited}$ and the corresponding eigenfunctions are $\frac{1}{\sqrt{2}}\begin{bmatrix}1\\1\end{bmatrix}$ and $\frac{1}{\sqrt{2}}\begin{bmatrix}1\\-1\end{bmatrix}$ respectively. Under the presence of external perturbation, its Hamiltonian is represented by $\begin{bmatrix} E_{ground} & \Delta E \\ \Delta E & E_{excited} \end{bmatrix}$. The first order correction to the eigenfunction $\frac{1}{\sqrt{2}}\begin{bmatrix}1\\-1\end{bmatrix}$ will be

(a) $\dfrac{\Delta E}{\sqrt{2}\left(E_{excited} - E_{ground}\right)}\begin{bmatrix}1\\1\end{bmatrix}$ (b) $-\dfrac{\Delta E}{\sqrt{2}\left(E_{excited} - E_{ground}\right)}\begin{bmatrix}1\\1\end{bmatrix}$

(c) $-\dfrac{\Delta E}{\sqrt{2}\left(E_{excited} - E_{ground}\right)}\begin{bmatrix}1\\-1\end{bmatrix}$ (d) 0

44. A particle of mass m is confined in a one-dimensional box extending from $x = 0$ to $x = L$ and average energy of the paricle comes out to be $\dfrac{h^2}{mL^2}$. The state of the particle will be of the following form:

(a) $\sqrt{\dfrac{2}{25L}}\sin\left(\dfrac{2\pi x}{L}\right) + \sqrt{\dfrac{32}{25L}}\sin\left(\dfrac{3\pi x}{L}\right)$ (b) $\sqrt{\dfrac{2}{25L}}\sin\left(\dfrac{4\pi x}{L}\right) + \sqrt{\dfrac{32}{25L}}\sin\left(\dfrac{5\pi x}{L}\right)$

(c) $\sqrt{\dfrac{2}{25L}}\sin\left(\dfrac{2\pi x}{L}\right) + \sqrt{\dfrac{32}{25L}}\sin\left(\dfrac{4\pi x}{L}\right)$ (d) $\sqrt{\dfrac{2}{25L}}\sin\left(\dfrac{3\pi x}{L}\right) + \sqrt{\dfrac{32}{25L}}\sin\left(\dfrac{4\pi x}{L}\right)$

45. Suppose the kets $|j, m_j\rangle$ are the simultaneous eigenkets of the operators J^2 and J_z with eigenvalues $j(j+1)\hbar^2$ and $m_j\hbar$ respectively. Then $|2,1\rangle$ will be eigenkets of the operator $[J_x, J_+]$ with respective eigenvalue ..... $\hbar$.

46. If a wave function $\psi(x)$ satisfies the following relation $x\psi(x) = -\left(\dfrac{ia^2}{\hbar}\right)p_x\psi(x)$ ('a' is real positive quantity), then $\psi(x)$ will be of the form

(a) $\psi_0 e^{-x/2}$ (b) $\psi_0 e^{x/2}$ (c) $\psi_0 e^{x^2/2}$ (d) $\psi_0 e^{-x^2/2}$

47. A hydrogen atom in its ground state is collided with an electron of kinetic energy 12.97 eV. The maximum factor by which the radius of the atom would increase is
(a) 4 (b) 5 (c) 16 (d) 25

48. In the presence of a weak magnetic field, the spectral line $^3D_2 \rightarrow {}^3P_1$ splits into ..... components.

49. The moment of inertia of a rigid diatomic molecule M_1 is 10/3 times that of another rigid diatomic molecule M_2. If the rotational energies of the molecules are equal, then the corresponding values of the roational quantum numbers J_A and J_B are

(a) $J_A = 4, J_B = 2$ (b) $J_A = 4, J_B = 1$ (c) $J_A = 5, J_B = 0$ (d) $J_A = 4, J_B = 3$

50. An electric field is represented by $\vec{E} = \hat{i}y + \hat{j}x$. The corresponding potential function ϕ will be (assume $\phi = 0$ at the point (0, 0)

(a) xy (b) $-xy$ (c) $\frac{x^2 + y^2}{2}$ (d) $\frac{x^2 - y^2}{2}$

51. The potential on the surface of a hollow sphere of radius 'a' is given by $\phi_0(\theta) = A\sin^2\theta/2$, where θ is the polar angle. The potential at any inside point can be written as

(a) $\frac{A}{2}\left(1 - \frac{r}{a}\cos\theta\right)$ (b) $\frac{A}{2}\left(1 + \frac{r}{a}\cos\theta\right)$ (c) $A\left(1 + \frac{r}{a}\cos\theta\right)$ (d) $A\left(1 - \frac{r}{a}\cos\theta\right)$

52. Certain volume current distribution $\vec{J}$ gives rise to the magnetic vector potential $\vec{A}(s, \phi, z) = K\hat{\phi}$, where K is a constant. The corresponding current distribution $\vec{J}$ will be

(a) $\frac{K}{\mu_0 s^2}\hat{s}$ (b) $\frac{K}{\mu_0 s^2}\hat{\phi}$ (c) $\frac{K}{2\mu_0 s^2}\hat{\phi}$ (d) $\frac{K}{2\mu_0 s}\hat{s}$

53. In a certain region of space through which an EM wave is propagating the poynting's vector is given by $\vec{s} = \hat{z}\,0.16\cos^2(kz - \omega t)\,W/m^2$. The total time average power carried by the wave through 100 cm^2 of area on the plane $y + 2z = 5$ will be .....mW.

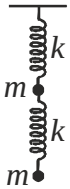
54. A particle moves along an orbit $r = A\cos\phi$ under the influence of a central field $F(r)$ of the form $\frac{1}{r^n}$. The value of n is .....

55. The Lagrangian for an anharmonic oscillator, is given as following $L(x, \dot{x}) = \frac{1}{2}\dot{x}^2 - \frac{1}{2}\omega^2 x^2 - \alpha x^3 + \beta x\dot{x}^2$, where α, β and ω are constants. The corresponding Hamiltonian of the system will be

(a) $\left(\frac{1}{2} + \beta x\right)\dot{x}^2 + \frac{1}{2}\omega^2 x^2 + \alpha x^3$ (b) $\left(\frac{1}{2} - \beta x\right)\dot{x}^2 + \frac{1}{2}\omega^2 x^2 + \alpha x^3$

(c) $\left(\frac{1}{2} - \beta x\right)\dot{x}^2 - \frac{1}{2}\omega^2 x^2 - \alpha x^3$ (d) $\left(\frac{1}{2} + \beta x\right)\dot{x}^2 - \frac{1}{2}\omega^2 x^2 - \alpha x^3$

56. Two similar springs, of spring constant k each, hang vertically downward from a rigid support with two equal masses 'm' attached to them as shown in the diagram below. The normal mode frequencies of small oscillation along the vertical direction, will be



(a) $\sqrt{\frac{k}{m}\left(3+\sqrt{5}\right)}, \sqrt{\frac{k}{m}\left(3-\sqrt{5}\right)}$

(b) $\sqrt{\frac{k}{2m}\left(3+\sqrt{5}\right)}, \sqrt{\frac{k}{2m}\left(3-\sqrt{5}\right)}$

(c) $\sqrt{\frac{k}{2m}}, \sqrt{\frac{3k}{2m}}$

(d) $\sqrt{\frac{k}{m}}, \sqrt{\frac{3k}{m}}$

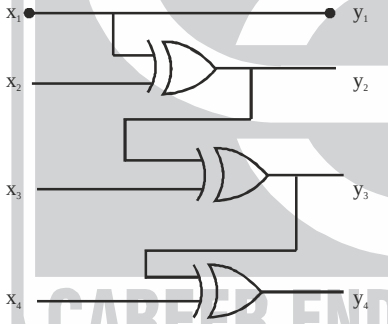
57. The potential energy of a particle is given by

$$V(x) = x^4 - 4x^3 - 8x^2 + 48x$$

Which of the following statement is TRUE?

(a) x = 2 is a point of stable equilibrium, x = –2, 3 are points of unstable equilibrium.
(b) x = –2 is a point of stable equilibrium, x = 2, 3 are points of unstable equilibrium.
(c) x = 2 is a point of unstable equilibrium, x = –2, 3 are points of stable equilibrium.
(d) x = 3 is a point of stable equilibrium, x = –2, 2 are points of unstable equilibrium.

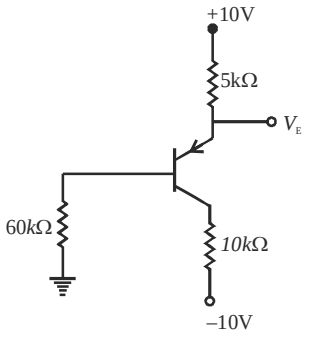
58. For the given digital circuit shown below



it behave as

(a) full adder
(b) full substractor
(c) binary to gray converter
(d) gray to binary converter

59. For the given emitter voltage is V_E = 2V. The value of α is _____



60. A point source emitting alpha particles is placed at a distance $1m$ from a counter which records any alpha particle falling on its $1cm^2$ window. If the source contains 6×10^{16} active nuclei and the counter records a rate of 50000 counts/second. Assume that the source emits alpha particles uniformly in all directions and the alpha particles fall nearly normally on the window. The Decay constant of the radioactive process is .....$\times10^{-7}\,s^{-1}$.

61. The spin-parity of grounded state of $^{47}_{22}Ti$ nucleus is

(a) $\left(\frac{7}{2}\right)^-$ (b) $\left(\frac{7}{2}\right)^+$ (c) $\left(\frac{5}{2}\right)^-$ (d) $\left(\frac{5}{2}\right)^+$

62. Protons with kinetic energy T strike a stationary hydrogen target. The threshold valueof T for the reaction $p + p \longrightarrow p + p + p + \overline{p}$ is .....GeV.

63. An intrinisic sample of silicon is doped with P and Al with doping densities of 1.5×10^{16} /cm^3 and 2.5×10^{16} /cm^3, respectively. If intrinsic carrier concentration of Si is 1.5×10^{10}/cm^3. The electron and hole densities per cm^3 are, respectively.

(a) $2.25\times10^4, 1\times10^{16}$ (b) $1.5\times10^4, 2.5\times10^{16}$

(c) $1\times10^{16}, 2.25\times10^4$ (d) $1.5\times10^{16}, 1\times10^4$

64. The band gap in a BCS superconductor is measured to be 3 meV at 0K. The critical temperatuer (T_C) of the superconductor is:

(a) 5K (b) 10K (c) 2K (d) 15K

65. The Hall coefficient R_H of sodium depends on

(a) The effective charge carrier mass and carrier density

(b) The charge carrier density and relaxation time

(c) The charge carrier density only

(d) The effective charge carrier mass.

space for rough work

PHYSICS-PH

Date: 19-01-2016

GATE TEST SERIES-III

ANSWER SHEET

1. (d)	**2. (b)**	**3. (c)**	**4. (c)**	**5. (a)**	**6. (a)**	**7. (d)**
8. (d)	**9. (a)**	**10. (a)**				
11. (c)	**12. (c)**	**13. (0.99)**	**14. (c)**	**15. (a)**	**16. (-0.25)**	**17. (c)**
18. (a)	**19. (2)**	**20. (15)**	**21. (c)**	**22. (b)**	**23. (4)**	
24. (b)	**25. (2)**	**26. (c)**	**27. (b)**	**28. (1)**	**29. (b)**	**30. (5)**
31. (1.40 to 1.42**)**		**32. (0.87 to 0.89)**		**33. (d)**	**34. (120)**	**35. (a)**
36. (360.28)	**37. (c)**					
38. (d)	**39. (a)**	**40. (b)**	**41. (12)**	**42. (d)**	**43. (d)**	**44. (a)**
45. (–1)	**46. (d)**	**47. (c)**	**48. (8)**	**49. (a)**	**50. (b)**	
51. (a)	**52. (b)**	**53. (0.71 to 0.73)**		**54. (5)**	**55. (a)**	**56. (b)**
57. (c)	**58. (d)**	**59. (**0.95 to 0.97**)**		**60. (1.04 to 1.06)**		
61. (c)	**62. (5.5 to 5.7)**		**63. (a)**	**64. (b)**	**65. (c)**	