TEST SERIES GATE 2017

BOOKLET SERIES A

Paper Code: PH

Test Type: TEST SERIES

Duration: 3:00 Hours

PHYSICS

Date: 13-01-2017

Maximum Marks: 100

Read the following instructions carefully:

1. Attempt all 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

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

1. Choose the word from the options given below that most nearly similar in the meaning of the ward **cognition.**
(a) Contradiction (b) Ignorance (c) Psychology (d) Percipience

2. **Marriage: Divorce :: Incorporate: ?**
(a) Dilute (b) Eraparate (c) Liquidate (d) Adulterate.

3. Choose the most appropriate words from the options given below to complete the following sentence.
He had a strong relish for public representation in his own person, but an extreme ..... of the like display in any other.
(a) Disrespect (b) Abhorrence (c) Grievance (d) Disappointment.

4. Select the most suitable phrase for the words underline in the given paragraph:
The scientist says that while be complete core meltdown at chernobyl was a major disaster, **it had fall for short of catastrophe** many nuclear power critics had feared, the so called 'China syndrome'. In that scenario the exposed core of a nuclear reactor become so hot that the molten material literally burns its way down through the earth. Chernobyl at least, proved that to be a myth.
(a) It fell far short of the catastrophe. (b) It fell far away of the catastrophe.
(c) It fell much short of the catastrophe. (d) It fell for shorter of the catastrophe.

5. One who believes that gaining pleasure is the most important thing in life.
(a) Hedonist (b) Headed (c) Harangue (d) Habitat

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

6. A student has 60% chance of passing in english and 44% chance of passing in mathematics. What is the percentage probability that he will pass in both subjects?
(a) 44 (b) 60 (c) 26.4 (d) 56

7. After an increment of 7 in both the numerator and denominator, a fraction changes to 13/100 of original value. Find the original fraction.
(a) 175 (b) 250 (c) 178 (d) 375

8. There are 20, 000 people living in Adarsh Colony, Durg. Out of them 9000 subscribe to Star TV network and 12000 to Zee TV Network. If 4000 subscribe to both, how many do not subscribe to any of the two?
(a) 3000 (b) 1000 (c) 4000 (d) 2000

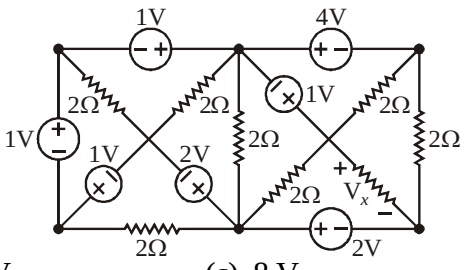
9. Find the number of zeros at the end of 1090!
(a) 270 (b) 268 (c) 271 (d) 278

10. $8+88+888+.....$ n term, then sum is

(a) $\frac{8\left(10^n-9n\right)}{81}$ (b) $\frac{8\left(10^{n+1}-10-9n\right)}{81}$ (c) $8\left(10^{n-1}-10\right)$ (d) $8\left(10^{n+1}-10\right)$

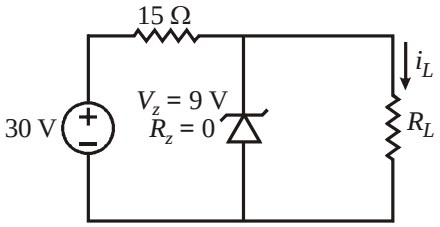
Q.11-Q.35 carry one mark each.

11. In the circuit of figure the voltage V_x is



(a) 3 V (b) 2 V (c) 8 V (d) 4 V

12. In the voltage regulator circuit shown below the maximum load current i_L that can be drawn is _____ mA.



13. Nine distinghuishable particles are distributed over three non-degenerate levels of energies $0, \in$ and $2 \in$. The energy of most probable macrostate of the system is

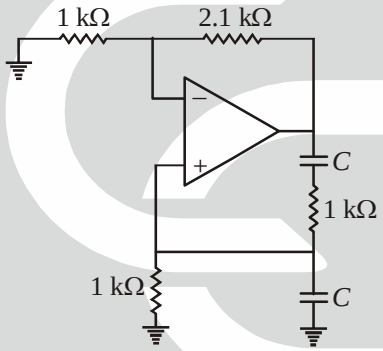
(a) $3 \in$ (b) $6 \in$ (c) $9 \in$ (d) $12 \in$

14. For an ideal B –E gas of N Bosons (where = $\frac{N}{V}$) the condensation temperature is:

(a) proportional to $n^{5/3}$ (b) proportional to $n^{2/3}$
(c) proportional to n (d) independent of n

15. If an amount of heat Q is added to 2 moles of a monatomic ideal gas at constant pressure. The work done by the gas is _____ Q.

16. The value of C required for sinusoidal oscillation of frequency 1 kHz in the following circuit is



(a) $\frac{1}{2\pi}\mu F$ (b) $2\pi\,\mu F$ (c) $\frac{1}{2\pi\sqrt{6}}\mu F$ (d) $2\pi\sqrt{6}\,\mu F$

17. Which of the following wavefunctions is the eigenfunction of the parity operator?

(a) $\psi(x) = x^2 e^{-\left(\frac{x-a}{b^2}\right)^2}$ (b) $\psi(x) = Axe^{-\frac{x^2}{a^2}}$ (c) $\psi(x) = A(x+a)^2 e^{-\frac{x^2}{a^2}}$ (d) All of the above

18. Consider a particle of mass m, moving in one-dimension whose wavefunction is given as following:

$$\psi(x) = \begin{cases} 2\alpha^{3/2} x e^{-\alpha x} & \text{for} \quad x > 0 \\ 0 & \text{for} \quad x < 0 \end{cases}$$

The most probable position of the particle will be

(a) α (b) $\frac{1}{\alpha}$ (c) $\frac{1}{\sqrt{\alpha}}$ (d) 0

19. The difference of energy between $n = 2$ and $n = 1$ level of a particle in a one dimensional infinite potential well is 6 units of energy. In the same units of energy, the difference of energy between $n = 3$ and $n = 2$ level, is _____

20. A particle of mass 'm' movces under the action of the force $\vec{F} = 4\hat{i} + 12t^2\hat{j}$ N, where 't' is the time in seconds. The initial velocity of the particle is $2\hat{i} + \hat{j} + 2\hat{k}\ ms^{-1}$. During the time interval $0 \le t \le 1$, the work done by $\vec{F}$ is 16J. The value of 'm' is ..... kg. (Upto one decimal place).

21. A planet of mass m_p is in a circular orbit around a star of mass m_s at a radius *R*. If the star loses a fraction *F* of its mass in a sudden explosion then what is the minimum fraction of mass that it must lose for the planet to escape to infinity?

(a) 1/2 (b) 1/4 (c) m_s / m_p (d) $\left(m_s / m_p\right)^2$

22. If $f_1 = \frac{1}{2}\left(xp_y - yp_x\right)$ and $f_2 = \left(x^2 + y^2 + p_x^2 + p_y^2\right)$, then the Poission bracket, $\left[f_1, f_2\right]$ is :

(a) –1 (b) +1 (c) 0 (d) xy

23. Half life of a radio isotope is 4×10^8 years. If there are 10^3 radioactive nuclei in a sample today, the number of such nucleai in the sample 4×10^9 years ago were

(a) 128×10^3 (b) 256×10^3 (c) 512×10^3 (d) 1024×10^3

24. The threshold energy for the nuclear reaction, $14N\left(n,\alpha\right)^{11}B$ is _____ MeV.

25. Suppose $\lambda_i\ (i = 1,2,3)$ are the eigenvalues of the matrix

$$A = \begin{bmatrix} 1 & 3 & 2 \\ 3 & -1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

Then the value $\sum_{i=1}^{3}\lambda_i^2$ will be

(a) 3 (b) 12 (c) 21 (d) 27

26. The fourier transform of $f(t) = e^{-t^2/2}\ (-\infty < t < \infty)$ will be

(a) $e^{-\omega^2}$ (b) $e^{-2\omega^2}$ (c) $e^{-\omega^2/4}$ (d) $e^{-\omega^2/2}$

27. The residue of the complex function $f(z) = \cot z$, at the point z = 0, will be

(a) 1 (b) 0 (c) ∞ (d) 1/2

28. A light beam is incident normally on an air-dielectric interface. On reflection intensity of the beam reduced by 4%. The dielectric constant of the dielectric is _____.

29. 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

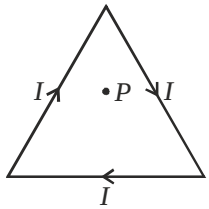
(a) 30° (b) 45° (c) 60° (d) 120°

30. 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

31. In a HCl molecule, the energy gap between the two vibrational levels is 0.36 eV. Its zero point energy will be _____ eV.

32. A current I flows in a triangular loop of each side *a*. Magnetic field at centroide of the triangle is



(a) $\frac{3\mu_0 I}{2\pi a}$ (b) $\frac{3\mu_0 I}{\pi a}$ (c) $\frac{3\sqrt{3}\mu_0 I}{2\pi a}$ (d) $\frac{9\mu_0 I}{2\pi a}$

33. If electrostatic potential in a charge free region be $V(x, y, z) = 3x^2 + \beta y^2 + 4z^2$ then value of β is

(a) – 1 (b) – 5 (c) – 7 (d) 2

34. The degeneracy of the excited state of nitrogen having configuration, $1s^2 2s^2 2p3d^2$ _____

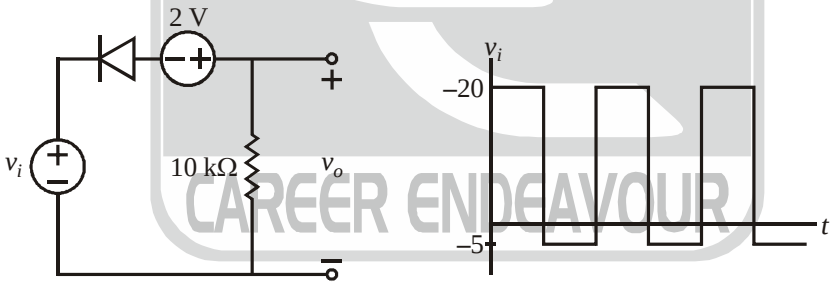
35. An intrinsic semiconductor with mass of a hole m_h, and mass of an electron m_e is at a finite temperature T. If the top of the valence band energy is E_V and the bottom of the conduction band energy is E_C, the Fermi energy of the semiconductor is

(a) $E_F = \left(\frac{E_V + E_C}{2}\right) - \frac{3}{4}k_B T \ln\left(\frac{m_h}{m_e}\right)$ (b) $E_F = \left(\frac{k_B T}{2}\right) + \frac{3}{4}(E_V + E_C)\ln\left(\frac{m_h}{m_e}\right)$

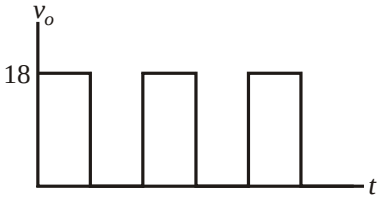
(c) $E_F = \left(\frac{E_V + E_C}{2}\right) + \frac{3}{4}k_B T \ln\left(\frac{m_h}{m_e}\right)$ (d) $E_F = \left(\frac{k_B T}{2}\right) - \frac{3}{4}(E_V + E_C)\ln\left(\frac{m_h}{m_e}\right)$

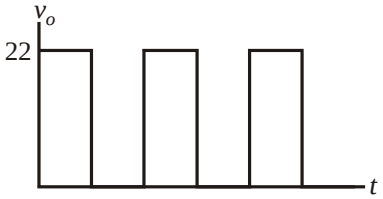
Q.36-Q.65 carry TWO marks each.

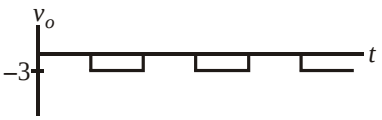
36. Consider the given circuit and a waveform for the input voltage. The diode in circuit has cutin voltage $V_\gamma = 0$.

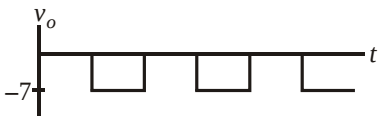


The waveform of output voltage v_0 is

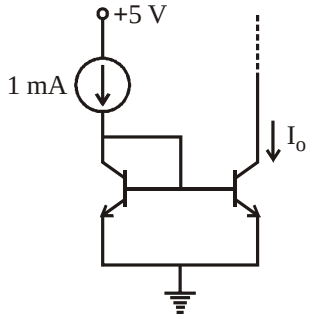
(a)


(b)


(c)


(d)


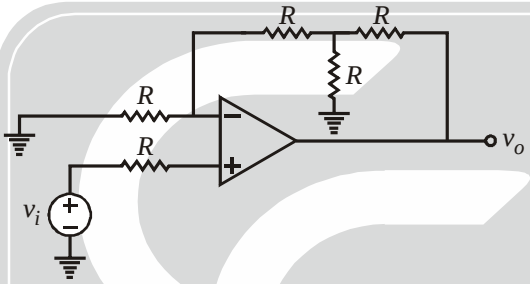
37. In the current mirror circuit shown below the transistor parameters are $V_{BE} = 0.7$ V, $\beta = 50$ and the Early voltage is infinite. Assume transistor are matched.



The output current I_o is

(a) 1.04 mA (b) 1.68 mA (c) 962 μA (d) 432 μA

38. For the circuit shown below the value of $A_v = \dfrac{v_o}{v_i}$ is _____



39. Consider a system of two ising spin S_1 and S_2 taking value ± 1 with interaction energy, $\in = -JS_1S_2$ in thermal equilibrium at temperature T. The number of configurations corresponding to ground state energy of the system is _____.

40. Consider a system of two distinguishable identical particles which can occupy any of three energy levels with energies $\varepsilon_1 = 0, \varepsilon_2 = \varepsilon$ and $\varepsilon_3 = 2\varepsilon$. Average energy of the system is

(a) $\dfrac{\varepsilon\left(e^{-\varepsilon/kT} + e^{-2\varepsilon/kT}\right)}{\left(1 + e^{-\varepsilon/kT} + e^{-2\varepsilon/kT}\right)}$ (b) $\dfrac{2\varepsilon\left(e^{-\varepsilon/kT} + 2e^{-2\varepsilon/kT}\right)}{\left(1 + e^{-\varepsilon/kT} + e^{-2\varepsilon/kT}\right)}$

(c) $\dfrac{2\varepsilon\left(e^{-\varepsilon/kT} + e^{-2\varepsilon/kT}\right)}{\left(1 + e^{-\varepsilon/kT} + e^{-2\varepsilon/kT}\right)}$ (d) $\dfrac{\varepsilon\left(e^{-\varepsilon/kT} + e^{-2\varepsilon/kT}\right)}{\left(1 + e^{-\varepsilon/kT} + e^{-2\varepsilon/kT}\right)^2}$

41. A zipper has N links. Each link has two states : state 1 means it is closed and has energy 0 and state 2 means it is open with energy $\in$. The zipper can only unzip from the left end and the sth link cannot open unless all the links to its left (1,2,3…… ,s– 1) are already open. The partition function for the zipper is

(a) $1 - \exp\left(-\dfrac{(N+1)\in}{kT}\right)$ (b) $\dfrac{1 - \exp\left(-\dfrac{N\in}{kT}\right)}{1 - \exp\left(-\dfrac{\in}{kT}\right)}$ (c) $\dfrac{1 - \exp\left(-\dfrac{(N+1)\in}{kT}\right)}{1 - \exp\left(-\dfrac{\in}{kT}\right)}$ (d) $1 + \exp\left(-\dfrac{N\in}{kT}\right)$

42. The probability of finding fermions (which are completely degenerate) when their energy is equal to the Fermi energy (defined at T = 0) at 100K, 150K and 200K are

(a) $\frac{1}{4},\frac{1}{5},\frac{1}{6}$ (b) $\frac{1}{3},\frac{1}{4},\frac{1}{5}$ (c) $\frac{1}{3},\frac{1}{3},\frac{1}{3}$ (d) $\frac{1}{2},\frac{1}{2},\frac{1}{2}$

43. A particle of mass m moves (non-relativistically) in three-dimensional potential

$$V=\frac{1}{2}k\left(x^2+y^2+z^2+\lambda xy\right)$$

Where λ is a small parameter. The ground state energy corrected to first order is

(a) $\frac{1}{2}\hbar\omega-\lambda$ (b) $\frac{3}{2}\hbar\omega-\lambda\hbar\omega$ (c) $\frac{3}{2}\hbar\omega$ (d) $\frac{1}{2}\hbar\omega$

44. Consider a particle of mass *m* is moving under the following 3-D potential:

$$V(x,y,z)=\begin{cases}0 & \text{for } 0<x<L,\ 0<y<L,\ 0<z<2L\\ \infty & \text{otherwise}\end{cases}$$

Which of the following statements is/are **CORRECT**?

(a) The difference in energy between the ground state and first excited state of the particle is $\frac{5h^2}{32mL^2}$

(b) The energy of the third excited state is $\frac{21\pi^2\hbar^2}{32mL^2}$.

(c) The degeneracy of the third excited state is 3.

(d) The energy of the third excited state is $\frac{21h^2}{32mL^2}$.

45. A particle of mass 'm' in the one dimensional energy well

$$V(x)=\begin{cases}0 & for\quad 0\le x\le L\\ \infty & otherwise\end{cases}$$

is in a state whose position space wavefunction is given by $\phi(x)=Cx(L-x)$, where C is Normalization constant . The expectation value of energy in the given state is

(a) $\frac{5\hbar^2}{mL^2}$ (b) $\frac{5\hbar^2}{2mL^2}$ (c) $\frac{9\hbar^2}{2mL^2}$ (d) none of these

46. An electron is bound in an infinite square-well potential on the *x*- axis. The width of the well is *L* and the well extends from *x* = 0 nm to *x* = 3.3 nm. In a given state, the normalized wave function of the electron is given by:

$$\psi(x)=\sqrt{\frac{2}{L}}\sin\left(\frac{2\pi x}{L}\right)$$

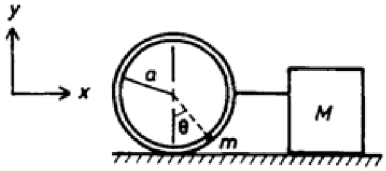
The probability per nm of finding the electron at *x = 1.65 nm,* is closest to _____. (Your answer should be upto two decimal places).

47. A spaceship S_1 leaves the earth surface along the positive *x*-direction. Another spaceship S_2 also leaves the earth along a direction that makes an angle 60^0 with *x*-axis. The speeds of S_1 and S_2 are measured as 0.6c and 0.9c respecively by an observer on the earth. The speed of S_2 as measured by an observer in S_1, is _____(in the units of ***c***).

48. A rocket starts vertically upward with a speed v_0. The velocity of the rocket at a height h from the earth surface is (Given, R is the radius of the earth and g is the acceleration due to gravity on the earth's surface).

(a) $\sqrt{v_0^2 - \frac{gh}{1+2hR}}$ (b) $\sqrt{v_0^2 - \frac{2gh}{1+h/R}}$ (c) $\sqrt{v_0^2 - \frac{gh}{1+h/R}}$ (d) $\sqrt{v_0^2 - \frac{gh}{1-h/R}}$

49. A block of mass 'M' is rigidly connected to a massless circular track of radius 'a' on a frictionless horizontal table as shown in figure. A particle of mass 'm' is confined to move without friction on the circular track which is vertical.



Lagrangian of the system will be

(a) $\frac{1}{2}M\dot{x}^2 + \frac{1}{2}m\left[\dot{x}^2 + a^2\dot{\theta}^2 + 2a\dot{x}\dot{\theta}\cos\theta\right] + mga\cos\theta$

(b) $\frac{1}{2}M\dot{x}^2 + \frac{1}{2}m\left[\dot{x}^2 + a^2\dot{\theta}^2 + 2a\dot{x}\dot{\theta}\cos\theta\right] - mga\cos\theta$

(c) $\frac{1}{2}M\dot{x}^2 + \frac{1}{2}m\left[\dot{x}^2 + a^2\dot{\theta}^2 + a\dot{x}\dot{\theta}\cos\theta\right] + mga\cos\theta$

(d) $\frac{1}{2}M\dot{x}^2 + \frac{1}{2}m\left[\dot{x}^2 + a\dot{\theta}^2 + 2a\dot{x}\dot{\theta}\cos\theta\right] - mga\cos\theta$

50. The nuclear spins of ${}_6C^{14}$ and ${}_{12}Mg^{25}$ nuclei are respectively
(a) Zero and half integer (b) Half integer and zero.
(c) An integer and a half integer (d) Both half integers.

51. Which of the following is a strong reaction in nature?
(a) $\pi^- + p \to \Sigma^+ + k^-$ (b) $k^- + p \to \Omega^- + k^+ + k^0$
(c) $\Omega^- \to \Xi^0 + \pi^-$ (d) $\Lambda^0 \to n + \Upsilon$

52. Protons with kinetic energy T strike a stationary hydrogen target. The threshold valueof T for the reaction, $p + p \longrightarrow p + p + p + \bar{p}$ is _____GeV.

53. The value of the integral

$$\int_c \left(x^2 \cdot e^{5z}dx + x \cdot \cos y\, dy + 3y\, dz\right)$$

(Where C is the curve defined by the parametric equations : $x = 0,\ y = 2 + 2\cos t,\ z = 2 + 2\sin t;\ 0 \le t \le 2$ will be equal to _____ π units.

54. A battery giving a constant voltage $E_0 = 40$ V is connected in series to a resistor of resistonce $20\,\Omega$ and an inductor of inductance 1 H. If the initial current in this circuit is 3A, then the current after 't' seconds will be

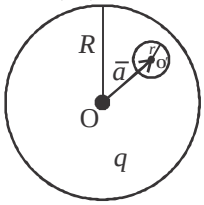
(a) $2 + e^{-20t}$ (b) $4 - e^{-20t}$ (c) $6 - 3e^{-20t}$ (d) $1 + 2 \cdot e^{-20t}$

55. The value of the following series:

$$\left(1+2+\frac{2}{3}+.....\right)^2-\left(2+\frac{4}{3}+\frac{4}{15}+.....\right)^2$$

will be _____.

56. A uniformly charged sphere of radius R and total charge q has a spherical cavity of radius r. If vector distance from centre of sphere to centre of cavity is $\bar{a}$, the electric field $\left(\bar{E}\right)$ in the cavity is :



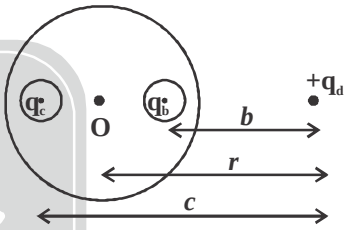
(a) 0

(b) $\frac{q\vec{r}}{4\pi\varepsilon_0 R^3}$

(c) $\frac{q\bar{a}}{4\pi\varepsilon_0 R^3}$

(d) $\frac{q\vec{r}}{4\pi\varepsilon_0 r^3}$

57. A spherical conductor has two cavities as shown in figure. A point charge $+q_b$ is at the centre of one cavity and $+q_c$ at the centre of the other. A charge $+q_d$ is placed at a very large distance *r* from the centre of the sphere. The force on charges q_b, q_c and q_d is, respectively.



(a) $\frac{q_b q_d}{4\pi\varepsilon_0 b^2}, \frac{q_c q_d}{4\pi\varepsilon_0 c^2}, \frac{(q_b+q_c)q_d}{4\pi\varepsilon_0 r^2}$

(b) $0, 0, \frac{q_d}{4\pi\varepsilon_0}\left(\frac{q_b}{b^2}+\frac{q_b}{c^2}\right)$

(c) $0, 0, \frac{q_c(q_b+q_c)}{4\pi\varepsilon_0 r^2}$

(d) $\frac{q_b q_c}{4\pi\varepsilon_0 (b-c)^2}, \frac{q_b q_c}{4\pi\varepsilon_0 (b-c)^2}, 0$

58. A parallel plate capacitor has circular plats of radius R and plate separation d << R. The potential difference between the plates varies as $V = V_0 \sin\omega t$. The total displacement current between the plates is

(a) $\frac{\varepsilon_0 V_0 \omega \pi R^2}{d}\sin\omega t$

(b) $\frac{\varepsilon_0 V_0 \omega}{d}\sin\omega t$

(c) $\frac{\varepsilon_0 V_0 \omega \pi R^2}{d}\cos\omega t$

(d) $\frac{\varepsilon_0 V_0 \omega}{d}\cos\omega t$

59. The lattice constant of monovalent fcc solid is 2Å. The radius of fermi sphere is _____ $Å^{-1}$.

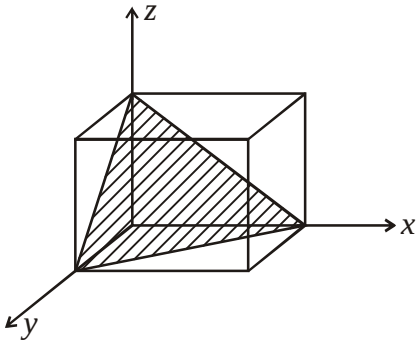
60. The separation between the lines in the microwave spectrum of a certain molecule is 20.68 cm^{-1}. The $J = 14 \rightarrow J = 15$ transition occurs at _____ cm^{-1}.

(Given the reduced mass of the molecule $1.62\times10^{-27} kg$).

61. A sphere of radius 'R' has uniform volume charge density. Electric field at the surface of sphere is E_s. Electrical potential at the centre of sphere will be

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

62. Planar density in SC on (111) plane is



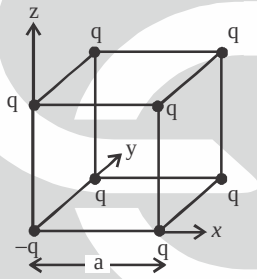
(a) $\frac{0.707}{a^2}$ (b) $\frac{1}{a^2}$ (c) $\frac{0.577}{a^2}$ (d) $\frac{0.288}{a^2}$

63. 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

64. The far infrared rotational absorption spectrum of a diatomic molecule shows equidistant lines with spacing 20 cm^{-1}. The position of the first stokes line in the rotational Raman spectrum of this molecule with respect to Rayleigh line is

(a) 20 cm^{-1} (b) 40 cm^{-1} (c) 60 cm^{-1} (d) 120 cm^{-1}

65. The cube shown in figure has charge +q at seven corners and a charge –q at one corner. Electric field vector at the centre of the cube is



(a) $-\frac{q}{3\pi\varepsilon_0}\left(\hat{i}+\hat{j}+\hat{k}\right)$ (b) $-\frac{q}{3\sqrt{3}\pi\varepsilon_0}\left(\hat{i}+\hat{j}+\hat{k}\right)$

(c) $\frac{2q}{3\pi\varepsilon_0}\left(\hat{i}+\hat{j}+\hat{k}\right)$ (d) $\frac{-2q}{3\sqrt{3}\pi\varepsilon_0}\left(\hat{i}+\hat{j}+\hat{k}\right)$

Space for rough work

PHYSICS-PH

Date: 13-01-2017

GATE TEST SERIES-A

ANSWER KEY

1. (d)	**2.** (c)	**3.** (b)	**4.** (a)	**5.** (a)
6. (a)	**7.** (a)	**8.** (a)	**9.** (a)	**10.** (b)
11. (d)	**12.** (1.3 to 1.5)	**13.** (c)	**14.** (b)	**15.** (0.4)
16. (a)	**17.** (b)	**18.** (b)	**19.** (10)	**20.** (3.9 to 4.1)
21. (a)	**22.** (c)	**23.** (d)	**24.** (**0.15**)	**25.** (c)
26. (d)	**27.** (a)	**28.** (**2.25**)	**29.** (d)	**30.** (a)
31. (**0.17 to 0.19**)	**32.** (d)	**33.** (c)	**34.** (**270**)	**35.** (c)
36. (c)	**37.** (c)	**38.** (5)	**39.** (2)	**40.** (b)
41. (c)	**42.** (d)	**43.** (c)	**44.** (d)	**45.** (a)
46. (0)	**47.** (0.86 to 0.90)	**48.** (b)	**49.** (a)	**50.** (c)
51. (b)	**52.** (**5.5 to 5.7**)	**53.** (12)	**54.** (a)	**55.** (1)
56. (b)	**57.** (c)	**58.** (c)	**59.** (**2.4 to 2.5**)	
60. (**310.0 to 310.4**)	**61.** (c)	**62.** (c)	**63.** (b)	**64.** (c)
65. (d)				