ASSIGNMENT 2: GATE PHYSICS IN: INSTRUMENTATION ENGINEERING

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Q.1-Q.25 carry one mark each.

1) Two matrices A and B are said to be similar if $B = P^{-1}AP$ for some invertible matrix P. Which of the following statements is **NOT TRUE**?

(GATE IN 2011)

a) $\det A = \det B$
b) Trace of A = Trace of B
c) A and B have the same eigenvectors
d) A and B have the same eigenvalues

2) If a force $\mathbf{F}$ is derivable from a potential function $V(r)$ where r is the distance from the origin of the coordinate system, it follows that

(GATE IN 2011)

a) $\nabla \cdot \mathbf{F} = 0$ b) $\overline{\nabla} \cdot \overline{F} = 0$ c) $\nabla V = 0$ d) $\nabla^2 V = 0$

3) The quantum mechanical operator for the momentum of a particle moving in one dimension is given by

(GATE IN 2011)

a) $i\hbar\dfrac{d}{dx}$ b) $-i\hbar\dfrac{d}{dx}$ c) $\dagger\dfrac{\partial}{\partial t}$ d) $-\dfrac{\hbar^2}{2m}\dfrac{d^2}{dx^2}$

4) A Carnot cycle operates on a working substance between two reservoirs at temperatures T_1 and T_2 with $T_1 > T_2$. During each cycle, an amount of heat Q_1 is extracted from the reservoir at T_1 and an amount Q_2 is delivered to the reservoir at T_2. Which of the following statements is **INCORRECT**?

(GATE IN 2011)

a) Work done in one cycle is $Q_1 - Q_2$
b) $\dfrac{Q_1}{T_1} = \dfrac{Q_2}{T_2}$
c) Entropy of the hotter reservoir decreases
d) Entropy of the universe (consisting of the working substance and the two reservoirs) increases

5) In a first order phase transition, at the transition temperature, specific heat of the system

(GATE IN 2011)

a) Diverges and its entropy remains the same
b) Diverges and its entropy has finite discontinuity
c) Remains unchanged and its entropy has finite discontinuity
d) Has finite discontinuity and its entropy diverges

6) The semi-empirical mass formula for the binding energy of a nucleus contains a surface correction term. This term depends on the mass number A of the nucleus as
(GATE IN 2011)

a) $A^{-1/3}$ b) $A^{1/3}$ c) $A^{2/3}$ d) A

7) The population inversion in a two-level laser material **cannot** be achieved by optical pumping because
(GATE IN 2011)

a) the rate of upward transitions is equal to the rate of downward transitions
b) the upward transitions are forbidden but downward transitions are allowed
c) the upward transitions are allowed but downward transitions are forbidden
d) the spontaneous decay rate of the higher level is very low

8) The temperature (T) dependence of magnetic susceptibility (χ) of a ferromagnetic substance with a Curie temperature (T_c) is given by
(GATE IN 2011)

a) for $T < T_c$, $\dfrac{C}{T - T_c}$
b) $\dfrac{C}{T - T_c}$, $T > T_c$
c) $\dfrac{C}{T\,T_c}$ for $T > T_c$
d) for all temperatures $\dfrac{C}{T + T_c}$

where C is a constant.

9) The order of magnitude of the energy gap of a typical superconductor is
(GATE IN 2011)

a) 1 MeV
b) 1 keV
c) 1 eV
d) 1 meV

10) Which of the following statements is **CORRECT** for a common emitter amplifier circuit?
(GATE IN 2011)

a) The output is taken from the emitter
b) There is 180° phase shift between input and output voltages
c) There is no phase shift between input and output voltages
d) Both *p-n* junctions are forward biased

11) A 3×3 matrix has elements such that its trace is 11 and its determinant is 36. The eigenvalues of the matrix are all known to be positive integers. The largest eigenvalue of the matrix is
(GATE IN 2011)

a) 18 b) 12 c) 9 d) 6

12) A heavy symmetrical top is rotating about its own axis of symmetry (the z-axis). If I_1, I_2 and I_3 are the principal moments of inertia along x, y and z axes respectively, then
(GATE IN 2011)

a) $I_2 = I_3,\ I_1 \neq I_2$ b) $I_1 = I_y,\ I_1 \neq I_2$ c) $I_1 = I_2,\ I_1 \neq I_3$ d) $I_1 = I_2 \neq I_3$

13) An electron with energy E is incident from left on a potential barrier,given by as shown in the figure.

$$V(x) = 0 \text{ for } x < 0$$
$$= V_0 \text{ for } x > 0$$

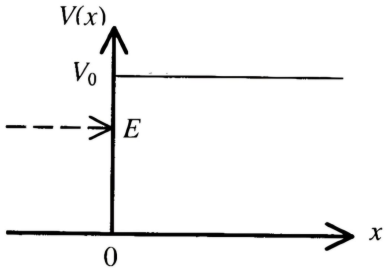


Fig. 1

For $E < V_0$, the space part of the wavefunction for $x > 0$ is of the form

(GATE IN 2011)

a) $e^{\alpha x}$ b) $e^{-\alpha x}$ c) $e^{i\alpha x}$ d) $e^{-i\alpha x}$

14) If L_x, L_y and L_z are respectively the x, y and z components of the angular momentum operator **L**, the commutator $[L_z L_x, L_z]$ is equal to

(GATE IN 2011)

a) $i\hbar\left(L_x^3 + L_y^2\right)$ b) $2i\hbar L_z$ c) $i\hbar\left(L_x^2 - L_y^2\right)$ d) 0

15) The normalized ground state wavefunction of a hydrogen atom is given by $\psi(r) = \frac{1}{\sqrt{4\pi}} \cdot \frac{2}{a^{5/2}}\, e^{-r/a}$ where a is the Bohr radius and r is the distance of the electron from the nucleus, located at the origin. The expectation value $\langle \frac{1}{r^2} \rangle$ is

(GATE IN 2011)

a) $\frac{8\pi}{a^2}$ b) $\frac{4\pi}{a^2}$ c) $\frac{4}{a^2}$ d) $\frac{2}{a^2}$

16) Two charges q and $2q$ are placed along the x-axis in front of a grounded, infinite conducting plane, as shown in the figure. They are located respectively at a distance of 0.5 m and 1.5 m from the plane. The force acting on the charge q is

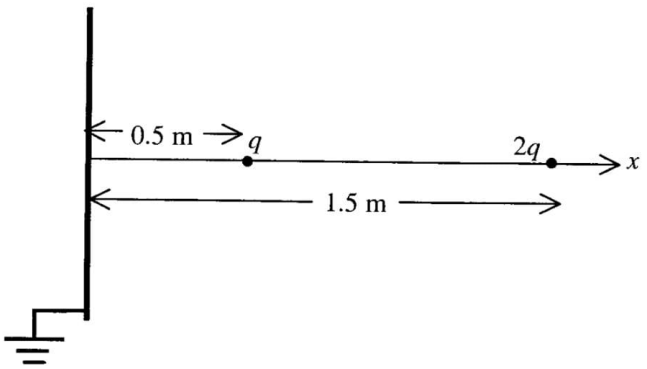


Fig. 2

(GATE IN 2011)

a) $\frac{1}{4\pi\epsilon_0} \cdot \frac{7q^2}{2}$ b) $\frac{1}{4\pi\epsilon_0} \cdot 2q^2$ c) $\frac{1}{4\pi\epsilon_0} \cdot q^2$ d) $\frac{1}{4\pi\epsilon_0} \cdot \frac{q^2}{2}$

17) A uniform surface current is flowing in the positive y-direction over an infinite sheet lying in x-y plane. The direction of the magnetic field is

(GATE IN 2011)

a) along $\hat{i}$ for $z > 0$ and along $-$ for $z < 0$
b) along for $z > 0$ and along $\hat{k}$ for $z < 0$
c) along $-\hat{i}$ for $z > 0$ and along ...
d) along $-\hat{k}$

18) A magnetic dipole of dipole moment $\mathbf{m}$ is placed in a non-uniform magnetic field $\mathbf{B}$. If the position vector of the dipole is $\bar{r}$, the torque acting on the dipole about the origin is

(GATE IN 2011)

a) $\mathbf{r} \times (\mathbf{m} \times \mathbf{B})$
b) $\mathbf{r} \times \nabla(\mathbf{m} \cdot \mathbf{B})$
c) $\mathbf{m} \times \mathbf{B}$
d) $\mathbf{m} \times \mathbf{B} + \mathbf{r} \times \nabla(\mathbf{m} \cdot \mathbf{B})$

19) Which of the following expressions for a vector potential **A does not** represent a uniform magnetic field of magnitude B_0 along the z-direction?

(GATE IN 2011)

a) $\overline{A} = (0, B_0 x, 0)$
b) $\overline{A} = (-B_0 y, 0, 0)$
c) $\mathbf{A} = \left(\frac{B_0 x}{2}, \frac{B_0 y}{2}, 0\right)$
d) $\mathbf{A} = \left(-\frac{B_0 y}{2}, \frac{B_0 x}{2}, 0\right)$

20) A neutron passing through a detector is detected because of

(GATE IN 2011)

a) the ionization it produces
b) the scintillation light it produces
c) the electron-hole pairs it produces
d) the secondary particles produced in a nuclear reaction in the detector medium

21) An atom with one outer electron having orbital angular momentum l is placed in a weak magnetic field. The number of energy levels into which the higher total angular momentum state splits, is

(GATE IN 2011)

a) $2l + 2$
b) $2l + 1$
c) $2l$
d) $2l - 1$

22) For a multi-electron atom, l, L, and S specify the one-electron orbital angular momentum, total orbital angular momentum, and total spin angular momentum, respectively. The selection rules for electric dipole transition between the two electronic energy levels, specified by l, L, and S are

(GATE IN 2011)

a) $\Delta L = 0, \pm 1;\ \Delta l = 0, \pm 1;\ \Delta S = 0$
b) $\Delta l = 0, \pm 1;\ \Delta S = 0;\ \Delta L = \pm 1$
c) $\Delta L = 0, 1;\ \Delta S = \pm 1;\ \Delta l = 0, \pm 1$
d) $\Delta L = 0;\ \Delta S = \pm 1;\ \Delta l = \pm 1$

23) For a three-dimensional crystal having N primitive unit cells with a basis of p atoms, the number of optical branches is

(GATE IN 2011)

a) 3 b) $3p$ c) $3p-3$ d) $3N-3p$

24) For an intrinsic semiconductor, m_e and m_h are respectively the effective masses of electrons and holes near the corresponding band edges. At a finite temperature, the position of the Fermi level

(GATE IN 2011)

a) depends on m_e but not on m_h
b) depends on m_h but not on m_e
c) depends on both m_e and m_h
d) depends neither on m_e nor on m_h

25) In the following circuit, the voltage across and the current through 2kΩresistance are

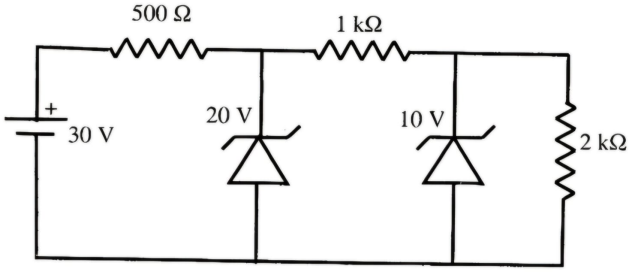


Fig. 3

(GATE IN 2011)

a) 20V, 10mA b) 20V, 5mA c) 10V, 10mA d) 10V, 5mA

26) The unit vector normal to the surface $x^2+y^2-z=1$ at the point $P(1,1,1)$ is

(GATE IN 2011)

a) $\frac{\hat{i}+\hat{j}-\hat{k}}{\sqrt{3}}$ b) $\frac{2\hat{i}+\hat{j}-\hat{k}}{\sqrt{6}}$ c) $\frac{\hat{i}+2\hat{j}-\hat{k}}{\sqrt{6}}$ d) $\frac{2\hat{i}+2\hat{j}-\hat{k}}{3}$

27) Consider a cylinder of height h and radius a, closed at both ends, centered at the origin. Let $\mathbf{r} = \hat{i}x + \hat{j}y + \hat{k}z$ be the position vector and $\hat{n}$ a unit vector normal to the surface. The surface integral $\int_S \mathbf{r}\cdot\hat{n}\,dS$ over the closed surface of the cylinder is

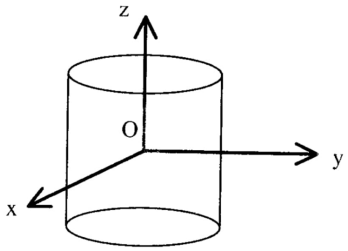


Fig. 4

(GATE IN 2011)

a) $2\pi a^2(a+h)$ b) $3\pi a^2 h$ c) $2\pi a^2 h$ d) zero

28) The solutions to the differential equation $\frac{dy}{dx} = -\frac{x}{y+1}$ are a family of

(GATE IN 2011)

a) circles with different radii
b) circles with different centres
c) straight lines with different slopes
d) straight lines with different intercepts on the y-axis

29) A particle is moving under the action of a generalized potential. The magnitude of the generalized force is

(GATE IN 2011)

a) $2(1+q)$ b) $2(1-q)$ c) $2q$ d) $4q$

30) Two bodies of mass m and $2m$ are connected by a spring of spring constant k. The frequency of the normal mode is

(GATE IN 2011)

a) $\sqrt{\frac{3k}{2m}}$ b) $\sqrt{\frac{k}{m}}$ c) $\sqrt{\frac{2k}{3m}}$ d) $\sqrt{\frac{k}{2m}}$

31) Let (q,p) and (Q,P) be two pairs of canonical variables. The transformation $Q = q^{\alpha}\cos(\beta p)$ is canonical for $P = q^{\alpha}\sin(\beta p)$.

(GATE IN 2011)

a) $\beta = \frac{1}{2},\ \alpha = 2$ b) $\alpha = 2,\ \beta = 2$ c) $\alpha = 1,\ \beta = 1$ d) $\beta = 2,\ \alpha = \frac{1}{2}$

32) Two particles, each of rest mass m, collide head-on and stick together. Before collision, the speed of each mass was 0.6 times the speed of light in free space. The mass of the final entity is

(GATE IN 2011)

a) $\frac{5m}{4}$ b) $2m$ c) $\frac{5m}{2}$ d) $\frac{25m}{8}$

33) The normalized eigenstates of a particle in a one-dimensional potential well are given by

$$V(x) = \begin{cases} 0, & 0 \le x \le a \\ \infty, & \text{otherwise} \end{cases}$$

where $n = 1, 2, 3, \ldots$ and

$$\psi_n(x) = \sqrt{\frac{2}{a}}\sin\left(\frac{n\pi x}{a}\right)$$

The particle is subjected to

$$V'(x) = \begin{cases} V_0\cos\left(\frac{\pi x}{a}\right), & 0 \le x \le \frac{a}{2} \\ 0, & \text{otherwise} \end{cases}$$

The shift in the ground state energy due to the perturbation, in the first order perturbation theory, is

(GATE IN 2011)

a) $\frac{2V_0}{3\pi}$ b) $\frac{V_0}{3\pi}$ c) $-\frac{V_0}{3\pi}$ d) $-\frac{2V_0}{3\pi}$

34) If the isothermal compressibility of a solid is 10^{-10} Pa^{-1}, the pressure required to increase its density by 1% is approximately:

(GATE IN 2011)

a) 10^4 Pa b) 10^6 Pa c) 10^8 Pa d) 10^{10} Pa

35) A system of N non-interacting and distinguishable particles of spin 1 is in thermodynamic equilibrium. The entropy of the system is:

(GATE IN 2011)

a) $2k_B \ln N$ b) $3k_B N$ c) $2Nk_B$ d) $Nk_B \ln 3$

36) A system has two energy levels with energies x and $2x$. The lower level is 4-fold degenerate while the upper level is doubly degenerate. If there are N non-interacting classical particles in the system, which is in thermodynamic equilibrium at a temperature T, the fraction of particles in the upper level is:

(GATE IN 2011)

a) $\dfrac{1}{1+e^{(-x)/(k_BT)}}$ c) $\dfrac{1}{2e^{x/(k_BT)}+4e^{2x/(k_BT)}}$

b) $\dfrac{1}{1+2e^{x/(k_BT)}}$ d) $\dfrac{1}{2e^{x/(k_BT)}-4e^{2x/(k_BT)}}$

37) A spherical conductor of radius a is placed in a uniform electric field $\overline{E} = E_0\hat{k}$. The potential at a point $P(r,\theta)$ for $r > a$ is given by:

$$\varphi(r,\theta) = \text{constant} - E_0 r\cos\theta + \frac{E_0 a^3}{r^2}\cos\theta$$

where r is the distance from the origin and θ is the angle OP makes with the z-axis.

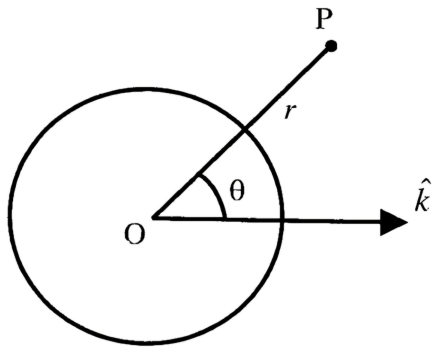


Fig. 5

The charge density on the sphere at $\theta = 30^\circ$ is:

(GATE IN 2011)

a) $\dfrac{3\sqrt{3}\ \epsilon_0 E_0}{2}$ b) $\dfrac{3\ \epsilon_0 E_0}{2}$ c) $\dfrac{\sqrt{3}\ \epsilon_0 E_0}{2}$ d) $\dfrac{\epsilon_0 E_0}{2}$

38) According to the single particle nuclear shell model, the spin-parity of the ground state of $^{17}_{8}$O is:

(GATE IN 2011)

a) $\dfrac{1}{2}^-$ b) $\dfrac{3}{2}^-$ c) $\dfrac{3}{2}^+$ d) $\dfrac{5}{2}^+$

39) In the β-decay of neutron $n \to p + e^- + \bar{\nu}_e$, the anti-neutrino escapes detection. Its existence is inferred from the measurement of:

(GATE IN 2011)

a) Energy distribution of electrons
b) Angular distribution of electrons
c) Helicity distribution of electrons
d) Forward-backward asymmetry of electrons

40) The isospin and the strangeness of Ω^- baryon are:

(GATE IN 2011)

a) $1, -3$ b) $0, -3$ c) $1, 3$ d) $0, 3$

41) The lifetime of an atomic state is 1 ns. The natural line width of the spectral line in the emission spectrum of this state is of the order of:

(GATE IN 2011)

a) 10^{-1} eV b) 10^{-3} eV c) 10^{-5} eV d) 10^{-7} eV

42) The degeneracy of an excited state of nitrogen atom having electronic configuration $1s^2\,2s^2\,2p^3\,3d^1$:

(GATE IN 2011)

a) 6 b) 10 c) 15 d) 150

43) The far infrared rotational absorption spectrum of a diatomic molecule shows equidistant lines with spacing $20\,\text{cm}^{-1}$. The position of the first Stokes line in the rotational Raman spectrum of this molecule is:

(GATE IN 2011)

a) $20\,\text{cm}^{-1}$ b) $40\,\text{cm}^{-1}$ c) $60\,\text{cm}^{-1}$ d) $120\,\text{cm}^{-1}$

44) A metal with body-centered cubic (bcc) structure shows the first (smallest angle) diffraction peak at a Bragg angle $\theta = 30°$. The wavelength of X-ray used is 2.1 Å. The volume of the primitive unit cell of the metal is:

(GATE IN 2011)

a) $26.2\,\text{Å}^3$ b) $13.1\,\text{Å}^3$ c) $9.3\,\text{Å}^3$ d) $4.6\,\text{Å}^3$

45) In the following circuit, Tr1 and Tr_2 are identical transistors having $VBE = 0.7$ V. The current passing through transistor Tr_2 is:

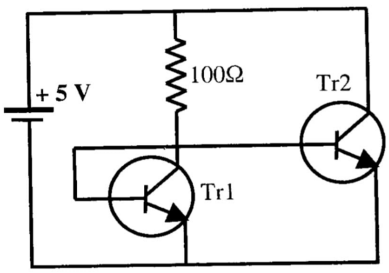


Fig. 6

(GATE IN 2011)

a) 57 mA b) 50 mA c) 48 mA d) 43 mA

46) The following Boolean expression

$$Y = A\overline{B}\,\overline{C}\,\overline{D} + \overline{A}B\,\overline{C}D + \overline{A}\,\overline{B}\,\overline{C}D + \overline{A}\,\overline{B}CD + \overline{A}BCD + A\,\overline{B}\,\overline{C}D$$

can be simplified into:

(GATE IN 2011)

a) $\overline{A}\,\overline{B}C + A\,\overline{D}$
b) $\overline{A}B\,\overline{C} + A\,\overline{D}$
c) $A\,\overline{B}\,\overline{C} + \overline{A}D$
d) $A\,\overline{B}C + \overline{A}D$

47) Consider the following circuit.

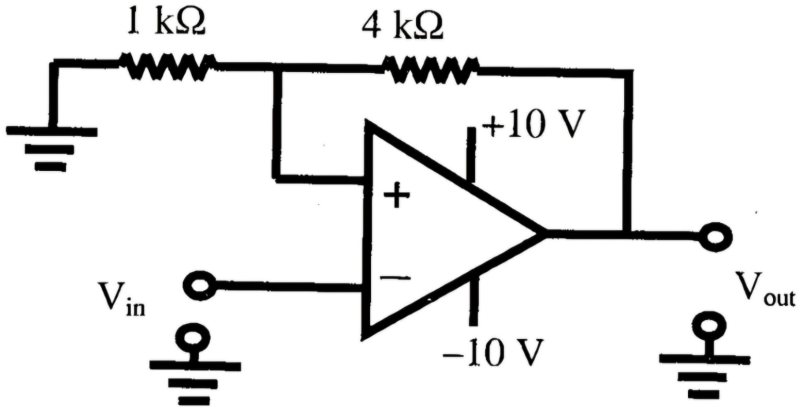
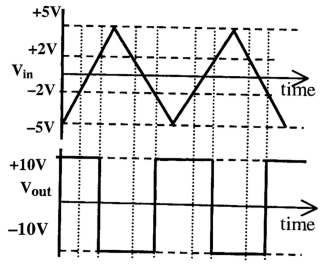


Fig. 7

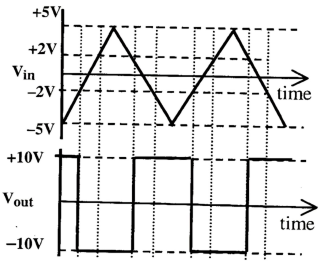
Which of the following correctly represents the output Vout corresponding to the input Vin ?

(GATE IN 2011)

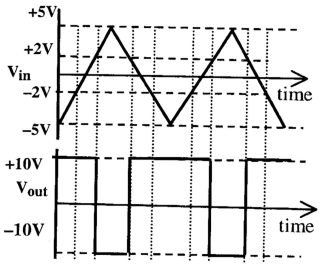
a)



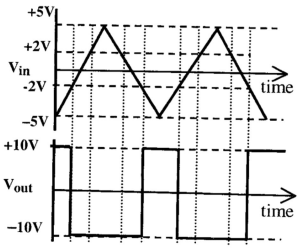
b)



c)



d)



Common Data for Questions 48 and 49:
Consider the function $f(z) = \frac{z \sin z}{(z-\pi)^2}$. of a complex variable z,

48) Which of the following statements is TRUE for the function $f(z)$?

(GATE IN 2011)

a) $f(z)$ is analytic everywhere in the complex plane
b) $f(z)$ has a zero at $z = \pi$
c) $f(z)$ has a pole of order 2 at $z = \pi$
d) $f(z)$ has a pole at $z = \pi$

49) Consider a counterclockwise circular contour $|z| = 1$ about the origin. The contour integral $\oint_{|z|=1} f(z)\, dz$ is

(GATE IN 2011)

a) $-i\pi$ b) 0 c) $i\pi$ d) $2i\pi$

Common Data for Questions 50 and 51:

The tight-binding energy dispersion relation for electrons in a one-dimensional array of atoms having lattice constant a and total length L is

$$E = E_0 - \beta - 2\gamma \cos(ka),$$

where E_0, β and γ are constants and k is the wave-vector.

50) The density of states of electrons (including spin degeneracy) in the band is given by:

(GATE IN 2011)

a) $\frac{L}{\pi \hbar a \sin(ka)}$
b) $\frac{L}{2\pi \gamma a \sin(ka)}$
c) $\frac{L}{\pi a \cos(ka)}$
d) $\frac{L}{2\pi a \cos(ka)}$

51) The effective mass of electrons in the band is given by:

(GATE IN 2011)

a) $\frac{\hbar^2}{\gamma a^2 \cos(ka)}$
b) $\frac{\hbar^2}{2\gamma a^2 \cos(ka)}$
c) $\frac{\hbar^2}{\gamma a^2 \sin(ka)}$
d) $\frac{\hbar^2}{2\gamma a^3 \sin(ka)}$

Statement for Linked Answer Questions 52 and 53:
In a one-dimensional harmonic oscillator, φ_0, φ_1, and φ_2 are respectively the ground, first, and second excited states. These three states are normalized and orthogonal to one another. Two states ψ_1 and ψ_2 are defined by:

$$\psi_1 = \varphi_0 - 2\varphi_1 + 3\varphi_2, \quad \psi_2 = \varphi_0 - \varphi_1 + \alpha\varphi_2,$$

where α is a constant.

52) The value of α for which ψ_2 is orthogonal to ψ_1 is:

(GATE IN 2011)

a) 2 b) 1 c) -1 d) -2

53) For the value of α determined above, the expectation value of energy of the oscillator in the state ψ_2 is:

(GATE IN 2011)

a) $\pi\hbar\omega$ b) $\frac{3\hbar\omega}{2}$ c) $3\hbar\omega$ d) $\frac{9\hbar\omega}{2}$

Statement for Linked Answer Questions 54 and 55:
A plane electromagnetic wave has the magnetic field:

$$\mathbf{B}(x, y, z, t) = B_0 \sin\left[\frac{k(x+y)}{\sqrt{2}} + \omega t\right] \hat{k},$$

where k is the wave number and $\hat{i}, \hat{j}, \hat{k}$ are the Cartesian unit vectors in x, y, and z directions respectively.

54) The electric field $\mathbf{E}(x, y, z, t)$ corresponding to the above wave is:

(GATE IN 2011)

a) $\frac{cB_0}{\sqrt{2}} \sin\left[\frac{k(x+y)}{\sqrt{2}} + \omega t\right](\hat{i} - \hat{j})$
b) $\frac{cB_0}{\sqrt{2}} \sin\left[\frac{k(x+y)}{\sqrt{2}} + \omega t\right](\hat{i} + \hat{j})$
c) $cB_0 \sin\left[\frac{k(x+y)}{\sqrt{2}} + \omega t\right]\hat{i}$
d) $cB_0 \sin\left[\frac{k(x+y)}{\sqrt{2}} + \omega t\right]\hat{j}$

55) The average Pointing vector is:

(GATE IN 2011)

a) $\frac{cB_0^2}{2\mu_0\sqrt{2}}(\hat{i} - \hat{j})$
b) $-\frac{cB_0^2}{2\mu_0\sqrt{2}}(\hat{i} - \hat{j})$
c) $\frac{cB_0^2}{2\mu_0\sqrt{2}}(\hat{i} + \hat{j})$
d) $-\frac{cB_0^2}{2\mu_0\sqrt{2}}(\hat{i} + \hat{j})$

56) Choose the most appropriate word from the options given below to complete the following sentence. If you are trying to make a strong impression on your audience, you cannot do so by being understated, tentative or

(GATE IN 2011)

a) hyperbolic
b) restrained
c) argumentative
d) indifferent

57) Choose the most appropriate word(s) from the options given below to complete the following sentence. I contemplated _____ Singapore for my vacation but decided against it.

(GATE IN 2011)

a) to visit
b) having to visit
c) visiting
d) for a visit

58) If $\log P = \frac{1}{2}\log Q = \frac{1}{3}\log R$, then which of the following options is TRUE?

(GATE IN 2011)

a) $P^2 = Q^3 \cdot R^2$
b) $Q^2 = PR$
c) $Q^2 = R^3 \cdot P$
d) $R = P^2 \cdot Q^2$

59) Which of the following options is the closest in meaning to the word below: **Inexplicable**

(GATE IN 2011)

a) Incomprehensible
b) Indelible
c) Inextricable
d) Infallible

60) Choose the word from the options given below that is most nearly opposite in meaning to the given word: **Amalgamate**

(GATE IN 2011)

a) merge
b) split
c) collect
d) separate

61) A transporter receives the same number of orders each day. Currently, he has some pending orders (backlog) to be shipped. If he uses 7 trucks, then at the end of the 4th day he can clear all the orders. Alternatively, if he uses only 3 trucks, then all the orders are cleared at the end of the 10th day. What is the minimum number of trucks required so that there will be no pending order at the end of the 5th day?

(GATE IN 2011)

a) 4
b) 5
c) 6
d) 7

62) The variable cost (V) of manufacturing a product varies according to the equation $V = 4q$ where q is the quantity produced. The fixed cost (F) of production of the same product reduces according to the equation $F = \frac{100}{q}$. How many units should be produced to minimize the total cost ($V + F$)?

(GATE IN 2011)

a) 5
b) 4
c) 7
d) 6

63) P, Q, R and S are four types of dangerous microbes recently found in a human habitat. The area of each circle with its diameter printed in brackets represents the growth of a single microbe surviving human immunity system within 24 hours of entering the body. The danger to human beings varies proportionately with the toxicity, potency and growth attributed to a microbe shown in the figure below:

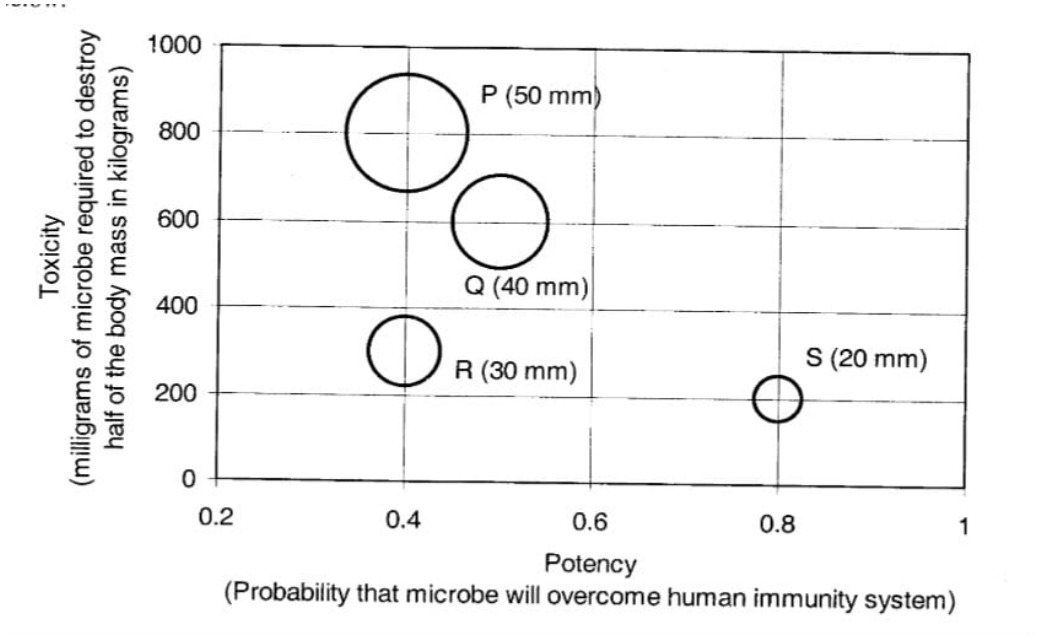


Fig. 8

A pharmaceutical company is contemplating the development of a vaccine against the most dangerous microbe. Which microbe should the company target in its first attempt?

(GATE IN 2011)

a) P b) Q c) R d) S

64) Few school curricula include a unit on how to deal with bereavement and grief, and yet all students at some point in their lives suffer from losses through death and parting.
Based on the above passage which topic would not be included in a unit on bereavement?

(GATE IN 2011)

a) how to write a letter of condolence
b) what emotional stages are passed through in the healing process
c) what the leading causes of death are
d) how to give support to a grieving friend

65) A container originally contains 10 litres of pure spirit. From this container 1 litre of spirit is replaced with 1 litre of water. Subsequently, 1 litre of the mixture is again replaced with 1 litre of water and this process is repeated one more time. How much spirit is now left in the container?

(GATE IN 2011)

a) 7.58 litres b) 7.84 litres c) 7 litres d) 7.29 litres

END OF THE QUESTION PAPER