SUBJECT CODE	SUBJECT	PAPER
C-16-17	PHYSICAL SCIENCES	III

HALL TICKET NUMBER	QUESTION BOOKLET NUMBER
	303963

OMR SHEET NUMBER

DURATION	MAXIMUM MARKS	NUMBER OF PAGES	NUMBER OF QUESTIONS
2 Hour 30 Minutes	150	16	75

This is to certify that, the entries made in the above portion are correctly written and verified.

Candidate's Signature

Name and Signature of Invigilator

INSTRUCTIONS FOR THE CANDIDATES

1. Write your Hall Ticket Number in the space provided on the top of this page.
2. This paper consists of seventy five multiple-choice type of questions.
3. At the commencement of examination. the question booklet will be given to you. In the first 5 minutes, you are requested **to open the booklet and compulsorily examine it as below :**
   (i) To have access to the Question Booklet, tear off the paper seal on the edge of this cover page. Do not accept a booklet without sticker-seal and do not accept an open booklet.
   (ii) **Tally the number of pages and number of questions in the booklet with the information printed on the cover page. Faulty booklets due to pages/questions missing or duplicate or not in serial order or any other discrepancy should be got replaced immediately by a correct booklet from the invigilator within the period of 5 minutes. Afterwards, neither the Question Booklet will be replaced ndr any extra time will be given.**
   (iii) After this verification is over, the Test Booklet Number should be entered in the OMR Sheet and the OMR Sheet Number should be entered on this Test Booklet.
4. Each item has four alternative responses marked (A), (B), (C) and (D). You have to darken the circle as indicated below on the correct response against each item.
   Example : (A) (B) ● (D)
   where (C) is the correct response.
5. Your responses to the items are to be indicated in the **OMR Answer Sheet given to you.** If you mark at any place other than in the circle in the OMR Answer Sheet, it will not be evaluated.
6. Read instructions given inside carefully.
7. Rough Work is to be done in the end of this booklet.
8. If you write your name or put any mark on any part of the OMR Answer Sheet, except for the space allotted for the relevant entries, which may disclose your identity, you will render yourself liable to disqualification.
9. **The candidate must handover the OMR Answer Sheet to the invigilators at the end of the examination compulsorily** and must not carry it with you outside the Examination Hall. The candidate is allowed to take away the carbon copy of OMR Sheet and used Question Paper Booklet at the end of the examination.
10. **Use only Blue/Black Ball point pen.**
11. **Use of any calculator or log table etc., is prohibited.**
12. **There is no negative marks for incorrect answers.**

అభ్యర్థులకు సూచనలు

1. ఈ పుట పై భాగంలో ఇవ్వబడిన స్థలంలో మీ హాల్ టికెట్ నంబరు రాయండి.
2. ఈ ప్రశ్న పత్రము డెభైఐదు బహుళైచ్ఛిక ప్రశ్నలను కలిగి ఉంది.
3. పరీక్ష ప్రారంభమున ఈ ప్రశ్నాపత్రము మీకు ఇవ్వబడుతుంది. మొదటి ఐదు నిమిషములలో ఈ ప్రశ్నాపత్రమును తెరిచి కింద తెలిపిన అంశాలను తప్పనిసరిగా సరిచూసుకోండి.
   (i) ఈ ప్రశ్న పత్రమును చూడడానికి కవర్‌పేజి అంచున ఉన్న కాగితపు సీలును చించండి. స్టిక్కర్ సీలులేని మరియు ఇదివరకే తెరిచి ఉన్న ప్రశ్నాపత్రమును మీరు అంగీకరించవద్దు.
   (ii) కవరు పేజి పై ముద్రించిన సమాచారం ప్రకారం ఈ ప్రశ్నపత్రములోని పేజీల సంఖ్యను మరియు ప్రశ్నల సంఖ్యను సరిచూసుకోండి. పేజీల సంఖ్యకు సంబంధించి గానీ లేదా సూచించిన సంఖ్యలో ప్రశ్నలు లేకపోవుట లేదా నిజప్రతి కాకపోవుట లేదా ప్రశ్నలు క్రమపద్ధతిలో లేకపోవుట లేదా ఏవైనా లేదాలుండుట వంటి దోషపూరితమైన ప్రశ్న పత్రాన్ని వెంటనే మొదటి ఐదు నిమిషాల్లో పరీక్షా పర్యవేక్షకునికి తిరిగి ఇచ్చివేసి దానికి బదులుగా సరిగ్గా ఉన్న ప్రశ్నపత్రాన్ని తీసుకోండి. తదనంతరం ప్రశ్నపత్రము మార్చబడదు అదనపు సమయం ఇవ్వబడదు.
   (iii) పై విధంగా సరిచూసుకొన్న తర్వాత ప్రశ్నాపత్రం సంఖ్యను OMR పత్రము పై అదేవిధంగా OMR పత్రము సంఖ్యను ఈ ప్రశ్నాపత్రము పై నిర్దిష్టస్థలంలో రాయవలెను.
4. ప్రతి ప్రశ్నకు నాలుగు ప్రత్యామ్నాయ ప్రతిస్పందనలు (A), (B), (C) మరియు (D) లుగా ఇవ్వబడ్డాయి. ప్రతి ప్రశ్నకు సరైన ప్రతిస్పందనను ఎన్నుకొని కింద తెలిపిన విధంగా OMR పత్రములో ప్రతి ప్రశ్నా సంఖ్యకు ఇవ్వబడిన నాలుగు వృత్తాల్లో సరైన ప్రతిస్పందనను సూచించే వృత్తాన్ని బాల్ పాయింట్ పెన్‌తో కింద తెలిపిన విధంగా పూరించాలి.
   ఉదాహరణ : (A) (B) ● (D)
   (C) సరైన ప్రతిస్పందన అయితే
5. ప్రశ్నలకు ప్రతిస్పందనలను ఈ ప్రశ్నపత్రముతో ఇవ్వబడిన OMR పత్రము పైన ఇవ్వబడిన వృత్తాల్లోనే పూరించి గుర్తించాలి. అలాకాక సమాధాన పత్రంపై వేరొక చోట గుర్తిస్తే మీ ప్రతిస్పందన మూల్యాంకనం చేయబడదు.
6. ప్రశ్న పత్రము లోపల ఇచ్చిన సూచనలను జాగ్రత్తగా చదవండి.
7. చిత్తుపనిని ప్రశ్నపత్రము చివర ఇచ్చిన ఖాళీస్థలములో చేయాలి.
8. OMR పత్రము పై నిర్దేశ స్థలంలో సూచించవలసిన వివరాలు తప్పించి ఇతర స్థలంలో మీ గుర్తింపును తెలిపే విధంగా మీ పేరు రాయడం గానీ లేదా ఇతర చిహ్నాలను పెట్టడం గానీ చేసినట్లయితే మీ అనర్హతకు మీరే బాధ్యులవుతారు.
9. పరీక్ష పూర్తయిన తర్వాత మీ OMR పత్రాన్ని తప్పనిసరిగా పరీక్ష పర్యవేక్షకుడికి ఇవ్వాలి. వాటిని పరీక్ష గది లయటకు తీసుకువెళ్లకూడదు. పరీక్ష పూర్తయిన తరువాత అభ్యర్థులు ప్రశ్న పత్రాన్ని, OMR పత్రం యొక్క కార్బన్ కాపీని తీసుకువెళ్లవచ్చు.
10. నీలి/నల్ల రంగు బాల్ పాయింట్ పెన్ మాత్రమే ఉపయోగించాలి.
11. లాగరిథమ్ టేబుల్స్, క్యాలిక్యులేటర్‌లు, ఎలక్ట్రానిక్ పరికరాలు మొదలగునవి పరీక్షగదిలో ఉపయోగించడం నిషేధం.
12. తప్పు సమాధానాలకు మార్కుల తగ్గింపు లేదు.

SEAL

PHYSICAL SCIENCES

Paper - III

1. If $f(x)$ is a polynomial of n^{th} degree, its $(n+1)^{th}$ differences are :
   (A) zero
   (B) constant
   (C) polynomials of 1^{st} degree
   (D) polynomials of 2^{nd} degree

2. Choose the **wrong** statement in relation to Green's function $G(x, t)$.
   (A) It provides the solution of non-homogenous boundary value problem
   (B) It provides the solution of homogeneous boundary value problem
   (C) It is characteristic of operator and the given boundary condition
   (D) It follows symmetry property $G(x, t) = G(t, x)$

3. In cubic spline interpolation :
   (A) the first derivatives of the splines are continuous at the interior data points
   (B) the second derivatives of the splines are continuous at the interior data points
   (C) the first and second derivatives of the splines are continuous at the interior data points
   (D) the third derivatives of the splines are continuous at the interior data points

4. T^{r}_{st} is a :
   (A) contravariant tensor of rank 2
   (B) contravariant tensor of rank 1
   (C) covariant tensor of rank 2
   (D) mixed tensor of rank 3

5. The value of y at $x = 0.05$, from the differential equation $\frac{dy}{dx} + xy = 0$ is _____, using Range - Kutta 2^{nd} order method. (Given $y(0) = 1$ and $h = 0.05$).
   (A) 0.9988 (B) 0.9888
   (C) 0.9898 (D) 0.9698

6. The next iterative value of the root of $x^2 - 4 = 0$ using the Newton - Raphson method, if the initial guess is 3, is :
   (A) 1.5 (B) 2.067
   (C) 2.167 (D) 3.000

7. If $f(x)$ is a real continuous function in [a, b], and $f(a)\, f(b) < 0$, then for $f(x) = 0$, there is (are) _____ in the domain [a, b].
   (A) one root
   (B) undeterminable number of roots
   (C) no root
   (D) at least one root

8. Match the following :

(a)	Poisson's equation	(i)	$\nabla^2\phi = \frac{1}{h^2}\frac{\partial\phi}{\partial t}$
(b)	Heat flow equation	(ii)	$\nabla^2\phi \pm k^2\phi = 0$
(c)	Laplace's equation	(iii)	$\nabla^2\phi = \frac{1}{c^2}\frac{\partial^2\phi}{\partial t^2}$
(d)	Wave equation	(iv)	$\nabla^2\phi = \rho$
(e)	Helmholtz equation	(v)	$\nabla^2\phi = 0$

Codes :

	(a)	(b)	(c)	(d)	(e)
(A)	(i)	(ii)	(iii)	(iv)	(v)
(B)	(iv)	(i)	(v)	(iii)	(ii)
(C)	(ii)	(iii)	(i)	(v)	(iv)
(D)	(iii)	(iv)	(i)	(v)	(ii)

9. Find out two important properties of a superconductor.

(A) zero resistivity and diamagnetism

(B) zero resistivity and paramagnetism

(C) zero resistivity and ferromagnetism

(D) zero resistivity and ferrimagnetism

10. The critical magnetic field at which superconductivity disappears is :

(A) $H_C = H_o\left[1 - \left(\frac{T}{T_C}\right)^{\frac{1}{2}}\right]$

(B) $H_C = H_o\left[1 - \left(\frac{T}{T_C}\right)^{2}\right]$

(C) $H_C = H_o\left[1 - \left(\frac{T}{T_C}\right)^{\frac{3}{2}}\right]$

(D) $H_C = H_o\left[1 - \left(\frac{T}{T_C}\right)^{\frac{-3}{2}}\right]$

11. Vander Waal bonds are found in :

(A) metallic crystals

(B) molecular crystals

(C) covalent crystals

(D) ionic crystals

12. At $E = E_F$, the energy function f(E) has the value :

(A) Zero (B) 1

(C) $\frac{1}{2}$ (D) $\frac{1}{3}$

13. According to kinetic theory of gases, the thermal conductivity (K) in terms of heat capacity (C), average particle velocity (v) and mean free path (l) is :

(A) $K = \frac{1}{2} Cvl$

(B) $K = Cvl$

(C) $K = 3\ Cvl$

(D) $K = \frac{1}{3} Cvl$

14. Burger Vector and Screw dislocation :

(A) are anti - parallel

(B) are parallel

(C) are perpendicular

(D) make an arbitrary angle

15. The mean energy $< E >$ of the phonon is given by :

(A) $\frac{h\nu}{e^{h\nu/3KT} - 1}$

(B) $\frac{h\nu}{e^{h\nu/2KT} - 1}$

(C) $\frac{h\nu}{e^{h\nu/KT} - 1}$

(D) $\frac{1}{e^{h\nu/KT} - 1}$

16. Which one from below is **not** compatible with crystal symmetry ?

(A) two-fold symmetry

(B) three-fold symmetry

(C) five-fold symmetry

(D) six-fold symmetry

17. For a perfect free-electron gas in a metal, the relation between the phase velocity (V_p) and group velocity (V_g) is :

(A) $V_g = V_p$

(B) $V_p = \frac{1}{2} V_g$

(C) $V_p = \sqrt{2}\ V_g$

(D) $V_p = 2V_g$

18. Which of the following X-ray diffraction method does not use monochromatic radiation ?

(A) Laue method

(B) Rotation method

(C) Powder method

(D) Weisenberg method

19. DC and AC Josephson tunneling effect (J-T) observed under one of the following conditions :

(A) DC J-T effect under DC voltage across the junction and AC J-T effect under DC voltage across the junction

(B) DC J-T effect under no voltage across the junction and AC J-T effect under DC voltage across the junction

(C) DC J-T effect under no voltage across the junction and AC J-T effect under no voltage across the junction

(D) DC J-T effect under AC voltage across the junction and AC J-T effect under AC voltage across the junction

20. In the presence of a strong magnetic field, the anomalous Zeeman pattern changes over to the normal Zeeman pattern. This phenomenon is referred to as :

(A) Normal Zeeman effect

(B) Anomalous Zeeman effect

(C) Paschen-Back effect

(D) Stark effect

21. The type of pumping used in Helium-Neon laser is :

(A) chemical pumping

(B) electrical discharge

(C) inelastic atom-atom collisions

(D) optical pumping

22. The ratio of Einstein coefficients of spontaneous emission and stimulated emission varies with frequency as :

(A) $\nu^{1/2}$ (B) ν

(C) $\nu^{3/2}$ (D) ν^3

23. The spectral term symbols for $S = \frac{1}{2}$ and $L = 2$ are :

(A) $^2S_{\frac{5}{2}}, {}^2S_{\frac{3}{2}}$ (B) $^2D_0, {}^3D_{\frac{3}{2}}$

(C) $^2D_{\frac{5}{2}}, {}^2D_{\frac{3}{2}}$ (D) $^2P_{\frac{5}{2}}, {}^2D_{\frac{3}{2}}$

24. The frequency of OH stretching vibration in CH_3OH is 3,300 cm^{-1}. The frequency of OD stretching vibration in CH_3OD is :

(A) 2,401 cm^{-1} (B) 4,401 cm^{-1}

(C) 2,501 cm^{-1} (D) 2,601 cm^{-1}

25. The number of lines in ESR spectrum of benzene radical ($C_6H_6^{\bullet}$) is :

(A) 6 (B) 8

(C) 7 (D) 5

26. The reference compound generally used to measure chemical shift in NMR studies is :

(A) $(CH_3)_4C$

(B) CH_3CH_2OH

(C) $(CH_3)_4S$

(D) $(CH_3)_4Si$

27. The number of fundamental vibrations in H_2O and CO_2 respectively are :

(A) 3, 4 (B) 4, 3

(C) 4, 6 (D) 6, 4

28. The Zeeman pattern of a line consists of nine equidistant components. The upper state is $3P_2$. Find out the lowest state term.

(A) $1S_1$ (B) $2S_1$

(C) $3P_1$ (D) $3S_1$

29. Irradiation of CCl_4 by 4358 Å radiation gives a Raman line at 4400 Å. The Raman shift of this line in cm^{-1} is :

(A) 229 cm^{-1} (B) 219 cm^{-1}

(C) 239 cm^{-1} (D) 42 cm^{-1}

30. The selection rules for the anharmonic oscillator are :

(A) $\Delta V = \pm 1$

(B) $\Delta V = \pm 1, \pm 2$

(C) $\Delta V = \pm 1, \Delta J = \pm 1$

(D) $\Delta V = \pm 1, \pm 2, \pm 3, ...$

31. The WKB approximation is valid for systems having :

(A) small mass, high energy and fast varying potential

(B) large mass, high energy and fast varying potential

(C) large mass, high energy and slow varying potential

(D) small mass, low energy and slow varying potential

32. Which of the following statements is **not** true ?

(A) The Klein-Gordon equation Predicts the spin of the particle.

(B) The Klein-Gordon equation has nothing to say about the spin of the particle.

(C) The Dirac equation constrains the spin of the particle to be $\frac{1}{2}$.

(D) The Klein-Gordon equation can be used for particles of spin zero.

33. The Hamiltonian of relativistic free particle is $H = c\,\bar{\alpha} \cdot \bar{p} + \beta\, mc^2$ where α_x, α_y, α_z and β are :

(A) Hermitian matrices

(B) Non hermitian square matrices

(C) Column matrices

(D) Row matrices

34. The scattering amplitude in the Born approximation is proportional to the :

(A) Fourier transform of the potential

(B) Square of the potential

(C) Momentum transferred

(D) Cube of the potential

35. The contribution to the total scattering cross section due to l^{th} partial wave is :

(A) $4\pi k^2 (2l+1) \sin^2\delta_l$

(B) $\frac{k^2}{4\pi} (2l+1) \sin^2\delta_l$

(C) $\frac{4\pi}{k^2} (2l+1) \sin^2\delta_l$

(D) $\frac{4\pi}{k^2} (2l+1) \sin\delta_l$

36. Hamilton's equations of motion in Poisson bracket :

(A) $q_k = [q_k, H]; p_k = [p_k, H]$

(B) $\dot{q_k} = [p_k, H]; \dot{p_k} = [q_k, H]$

(C) $\dot{q_k} = [q_k, H]; \dot{p_k} = [p_k, H]$

(D) $q_k = [H, q_k]; p_k = [H, p_k]$

37. If the functions F and G depend upon the position coordinates q_k, momentum coordinates p_k and time t, then the Poisson bracket of F and G is :

(A) $[F, G]_{q, p} = \sum_{k=1}^{n} \left(\frac{\partial F}{\partial q_k} \frac{\partial G}{\partial p_k} - \frac{\partial F}{\partial p_k} \frac{\partial G}{\partial q_k} \right)$

(B) $[F, G]_{q, p} = \sum_{k=1}^{n} \left(\frac{\partial F}{\partial q_k} \frac{\partial G}{\partial p_k} + \frac{\partial F}{\partial p_k} \frac{\partial G}{\partial q_k} \right)$

(C) $[F, G]_{q, p} = \sum \left(\frac{\partial F}{\partial p_k} \frac{\partial G}{\partial q_k} - \frac{\partial F}{\partial q_k} \frac{\partial G}{\partial p_k} \right)$

(D) $[F, G]_{q, p} = \left(\frac{\partial F}{\partial p} \frac{\partial G}{\partial q} - \frac{\partial F}{\partial q} \frac{\partial G}{\partial p} \right)$

38. The relation between Hamilton's principal function S and Hamilton's characteristic function W for a conservative is

(E is the energy and t is the time)

(A) $S = W - E^2 t$

(B) $S = W$

(C) $S = W + Et$

(D) $S = W - Et$

39. Hamilton - Jacobi equation is _____.

(A) $H\left(q_k, \frac{\partial s}{\partial q_k}, t\right) + \frac{\partial s}{\partial t} = 0$

(B) $H\left(q_k, \frac{\partial s}{\partial t}, t\right) - \frac{\partial s}{\partial t} = 0$

(C) $H\left(q_k, \frac{\partial s}{\partial p_k}, t\right) - \frac{\partial s}{\partial t} = 0$

(D) $H\left(q_k, \frac{\partial s}{\partial p_k}, t\right) + \frac{\partial s}{\partial t} = 0$

Here s is Hamilton's principal function, q_k and p_k are generalised coordinates and momenta and t is the time.

40. Transformation equations corresponding to generating function $F(q_k, p_k, t)$ are :

(A) $p_k = \frac{\partial F}{\partial q_k}$; $q_k = \frac{\partial F}{\partial p_k}$

(B) $p_k = \frac{\partial F}{\partial q_k}$; $Q_k = \frac{\partial F}{\partial P_k}$

(C) $P_k = \frac{\partial F}{\partial q_k}$; $Q_k = \frac{\partial F}{\partial p_k}$

(D) $p_k = \frac{\partial F}{\partial q_k}$; $Q_k = -\frac{\partial F}{\partial P_k}$

41. Choose the **wrong** statement for Noether's theorem.

(A) linear momentum is conserved if the Lagrangian is independent of the location of the origin

(B) energy is conserved if the Lagrangian is independent of base time

(C) angular momentum is conserved if Lagrangian is independent of angle of measurement

(D) linear momentum, energy and angular momentum are conserved if the Lagrangian depends on location of the origin.

42. The size of the atomic nucleus is _____ times greater than the atomic size.

(A) 10^2 (B) 10^4

(C) 10^8 (D) 10^{10}

43. The charge density of the nucleus _____ as the size of the nucleus increases.

(A) decreases

(B) increases

(C) is almost constant

(D) decreases then increases

44. The mean life times of free proton and neutron are :

(A) stable and 920 sec.

(B) 920 sec. and stable

(C) stable and stable

(D) 1220 sec. and 920 sec.

45. The average binding energy per nucleon in a nucleus is larger by almost a factor of _____ than the average binding energy of an electron in an atom.

(A) 10^1 (B) 10^2

(C) 10^5 (D) 10^{10}

46. In which of the following decay processes an element X forms its isotope ?

(A) α, β, β (B) α, β, γ

(C) β, γ, γ (D) α, γ, γ

47. For the Weizsacker's semi-empirical mass formula to nuclei, match the following binding energy terms :

(a) Volume energy (i) $-\frac{Z^2}{A^{\frac{1}{3}}}$

(b) Surface energy (ii) $-\frac{\left(\frac{A}{2}-Z\right)^2}{A}$

(c) Asymmetry energy (iii) $-A^{\frac{2}{3}}$

(d) Coulomb's energy (iv) A

Codes :

	(a)	(b)	(c)	(d)
(A)	(ii)	(iii)	(i)	(iv)
(B)	(iv)	(iii)	(ii)	(i)
(C)	(i)	(ii)	(iii)	(iv)
(D)	(iv)	(i)	(iii)	(ii)

48. The probability for the α-particle to tunnel through the Coulomb potential barrier can be calculated by :

(A) time-dependent perturbation theory

(B) time-independent perturbation theory

(C) variation method

(D) WKB approximation

49. (a) A nuclei having the same number of neutrons but differ in their proton number are known as isotones.

(b) A nuclei with same mass number but different proton number is called isobars.

Codes :

(A) Statements (a) and (b) are correct

(B) Statements (a) and (b) are wrong

(C) Statement (a) is correct whereas (b) is wrong

(D) Statement (a) is wrong whereas (b) is correct

50. If a particle P, with spin $\frac{1}{2}$, undergoes the decay

$P \rightarrow X + Y + Z$

Where X and Y are also spin $\frac{1}{2}$ particles, then the complete set of allowed values of the spin of the particle Z is :

(A) 0, 1

(B) $\frac{1}{2}$ only

(C) $\frac{1}{2}, \frac{3}{2}, \frac{5}{2}, \ldots$

(D) $1, \frac{3}{2}, 2, \frac{5}{2}, \ldots$

51. For a particle the Gellmann and Nishijima formula relates :

(A) electric charge and hyper charge

(B) electric charge and isospin

(C) isospin and hypercharge

(D) electric charge, isospin and hypercharge

52. Which of the following does not made of quarks ?

(A) baryons (B) mesons

(C) leptons (D) pion

53. A linear displacement digital transducer normally uses :

(A) Straight binary code

(B) BCD

(C) Gray code

(D) Hexadecimal code

54. A high pass filter a time constant of $\bar{z}$. Its gain at a frequency ω is :

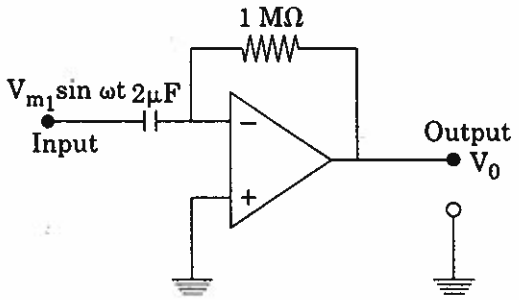
(A) $\sqrt{1 + (\omega\bar{z})^2}$

(B) $\frac{\omega\bar{z}}{\sqrt{1 + \omega^2 z^2}}$

(C) $\frac{1}{\sqrt{1 + (\omega\bar{z})^2}}$

(D) $\frac{\sqrt{1 + \omega^2\bar{z}^2}}{\omega z}$

55. If the input to the following circuit is $V_{m_1} \sin \omega t$ then its output will be :



(A) $-2V_{m_1} \cos \omega t$

(B) $\frac{\omega}{2} V_{m_1} \sin \omega t$

(C) $-2\omega V_{m_1} \sin \omega t$

(D) $2\omega V_{m_1} \sin \omega t$

56. In an amplituded modulated signal with modulating frequency ω_m and carrier frequency ω_c the bandwidth of the wave will be :

(A) ω_m (B) ω_c
(C) $2\omega_m$ (D) $\omega_c - \omega_m$

57. In TV signals transmission are :

(A) Sound signal is frequency modulated and picture signal is amplitude modulated

(B) Sound signal is frequency modulated and picture is frequency signal modulated

(C) Sound signal is amplitude modulated and picture signal is frequency modulated

(D) Sound signal is amplitude modulated and picture signal is amplitude modulated

58. The impedance matching condition between a source resistance R_S and load resistance R_L is :

(A) $R_S < R_L$ (B) $R_L = R_S$
(C) $R_S > R_L$ (D) $R_S = 0$

59. Radiation pyrometers are used in the tempt. range of :

(A) 0° to 500°C

(B) 500° to 1000°C

(C) −250° to 500°C

(D) 1200° to 2500°C

60. The Instrumentation Amplifier has :

(A) high input impedance and low bandwidth

(B) high input impedance and high bandwidth

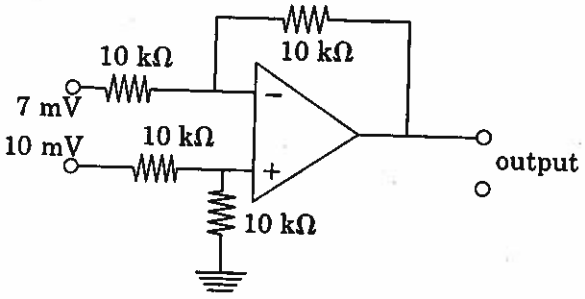
(C) low input impedance and high bandwidth

(D) low input impedance and low bandwidth

61. The output of an op-amp is 2V peak. The slew rate is 5V/μs. The input sinusoidal which can be reproduced with no distortion has the maximum frequency of :

(A) 398 Hz (B) 1592 Hz
(C) 125000 Hz (D) 398000 Hz

62. Output of the circuit given below is :



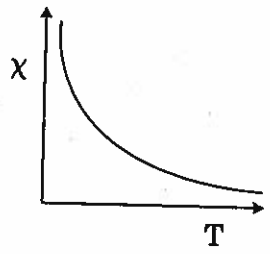
(A) 17 mV (B) 34 mV
(C) 3 mV (D) −17 mV

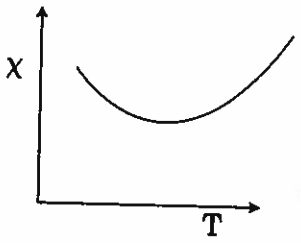
63. If n^{th} order derivative of Gibbs free energy is discontinuous then the phase transition is of :
(A) First order
(B) n^{th} order
(C) $(n-1)^{th}$ order
(D) $(n+1)^{th}$ order

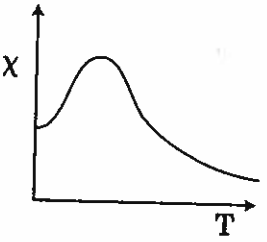
64. The Bose-Einstein condensation temperature T_c is the temperature at which :
(A) all the particles in the excited states
(B) half of the particles in the ground state
(C) 1/3 of the particles in the excited states
(D) 2/3 of the particles in the ground state

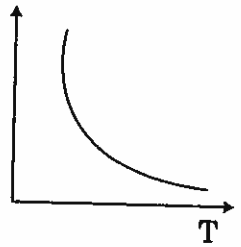
65. Ising model shows the magnetic phase transition at :
(A) $T < 0$ (B) $T = 0$
(C) $T = \infty$ (D) finite T

66. For a antiferromagnetic system the temperature dependence of the magnetic susceptibility is :

(A)


(B)


(C)


(D)


67. The relation between the coefficient of diffusion D and the mobility μ of the particles is :

(A) $D = \frac{1}{KT\mu}$ (B) $D = \frac{KT}{\mu}$

(C) $D = \frac{\mu}{KT}$ (D) $D = KT\mu$

68. The magnetic susceptibility of free electron gas due to orbital degree of freedom is :

(A) negative and proportional to temperature

(B) positive and proportional to temperature

(C) negative and inversely proportional to temperature

(D) none of these

69. The magnetic field associated with the electric field vector $\vec{E} = E_0 \cos(kz - \omega t)\, \hat{i}$ is :

(A) $\vec{B} = \frac{E_0}{c} \cos(kz - \omega t)\, \hat{j}$

(B) $\vec{B} = \frac{-E_0}{c} \cos(kz - \omega t)\, \hat{k}$

(C) $\vec{B} = \frac{E_0}{c} \sin(kz - \omega t)\, \hat{i}$

(D) $\vec{B} = \frac{-E_0}{c} \sin(kz - \omega t)\, \hat{j}$

70. Intime dependent fields, the retarded potentials are obtained from :

(A) The conservative nature phenomena of the fields

(B) The non conservative nature phenomena of the fields

(C) The gradient of scalar potential function

(D) The divergence of vector potential function

71. The Poynting vector is the energy flow :

(A) per unit area per unit time

(B) per unit volume

(C) per unit time

(D) independent of volume and time

72. If the charge on a parallel plate capacitor is $q = q_0 \sin\omega t$, then displacement current is :

(A) $\omega q_0 \cos\omega t$

(B) $\frac{q_0}{\omega} \cos\omega t$

(C) $\frac{-q_0}{\omega} \cos\omega t$

(D) $-\omega q_0 \cos\omega t$

73. If a free charge is imbedded in a piece of glass of permittivity 2×10^{-11} Coulomb^2/Nm^2 and conductivity $\simeq 10^{-12}$ ohm m; then the time taken by the free charge to flow to the surface :

(A) 10 sec

(B) 200 secs

(C) 20 secs

(D) 2 secs

74. The intensity of radiated energy by an oscillating electric dipole at a distance along the equitorial line to its axis is proportional to :

(A) $\frac{1}{r^2}$

(B) $\frac{1}{r}$

(C) $\frac{1}{r^3}$

(D) $\frac{1}{r^4}$

75. A rectangular waveguide of dimensions a; b with a > b and a square waveguide of dimension a, the ratio of cut off wave lengths of rectangular to square waveguide for TE_{11} mode is :

(A) $\frac{\sqrt{2}\, b}{\sqrt{a^2 + b^2}}$

(B) $\frac{\sqrt{2}\, a}{\sqrt{a^2 + b^2}}$

(C) $\frac{\sqrt{a^2 + b^2}}{a}$

(D) $\frac{\sqrt{a^2 + b^2}}{2a}$

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Space For Rough Work

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