SUBJECT CODE	SUBJECT	PAPER
B-16-17	**PHYSICAL SCIENCES**	**II**

HALL TICKET NUMBER	QUESTION BOOKLET NUMBER
	204081

OMR SHEET NUMBER

DURATION	MAXIMUM MARKS	NUMBER OF PAGES	NUMBER OF QUESTIONS
1 Hour 15 Minutes	100	12	50

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 fifty 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 nor 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 యాభై బహుళైచ్ఛిక ప్రశ్నలను కలిగి ఉంది.
3. పరీక్ష ప్రారంభమున ఈ ప్రశ్నాపత్రము మీకు ఇవ్వబడుతుంది. మొదటి ఐదు నిమిషములలో ఈ ప్రశ్నాపత్రమును తెరిచి కింద తెలిపిన అంశాలను తప్పనిసరిగా నరిచూసుకోండి.
   (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 నిర్దిష్ట 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

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PHYSICAL SCIENCES

Paper - II

1. The curl of a vector $\vec{F}$ is $2\hat{x}$. Identify the appropriate vector field $\overline{F}$ from the choices given below :

(A) $\overline{F} = 2z\hat{x} + 3z\hat{y} + 5y\hat{z}$

(B) $\overline{F} = 3z\hat{y} + 5y\hat{z}$

(C) $\overline{F} = 3x\hat{y} + 5y\hat{z}$

(D) $\overline{F} = 2\hat{x} + 5y\hat{z}$

2. Match the following physical quantities in Group-I with their dimensions in Group-II :

	Group - I		Group - II
(a)	Energy	(i)	ML^2T^{-3}
(b)	Power	(ii)	$ML^{-1}T^{-1}$
(c)	Momentum	(iii)	ML^2T^{-2}
(d)	Modulus of elasticity	(iv)	ML^1T^{-1}
(e)	Viscosity	(v)	$ML^{-1}T^{-2}$

Codes :

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

3. Stokes theorem relates the transformation from :

(A) Surface integral to volume integral

(B) Volume integral to line integral

(C) Line integral to surface integral

(D) Volume integral to surface integral

4. Match the following :

(a)	Singular matrix	(i)	sum of the diagonal elements of a square matrix
(b)	Adjoint of a matrix	(ii)	transpose of the matrix formed by the cofactors of the elements of its determinant
(c)	Trace of a matrix	(iii)	largest of any non-vanishing minor of the matrix
(d)	Rank of a matrix	(iv)	square matrix with determinant zero

Codes :

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

5. The eigen values of the matrix $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & 1 & 1 \end{pmatrix}$ are :

(A) 0, 1, 2

(B) 0, −1, −2

(C) 0, 1, −2

(D) 0, −1, 2

6. The equation $y(x)y''(x) - xy'(x) + 2y(x) = 3$ is a :

(A) linear homogeneous second order ordinary differential equation

(B) non-linear homogeneous second order ordinary differential equation

(C) linear inhomogeneous second order ordinary differential equation

(D) linear homogeneous second order partial differential equation

7. If f(s) is the Laplace transform of F(t), then the Laplace transform of F(at) is :

(A) f(s/a) (B) f(a/s)

(C) $\frac{1}{a} f\left(\frac{s}{a}\right)$ (D) $\frac{1}{a} f f\left(\frac{a}{s}\right)$

8. The mean of the Poisson's distribution $P(r) = \frac{m^r e^{-m}}{r!}$ is :

(A) $\frac{m}{r}$ (B) $\frac{m}{r!}$

(C) m (D) r

9. The probability of happening an event A is $\frac{1}{3}$ and probability of happening the event B is $\frac{1}{4}$. Both A and B events are independent. Then the probability of happening both events A and B simultaneously will be :

(A) $\frac{1}{12}$ (B) $\frac{3}{4}$

(C) $\frac{7}{12}$ (D) $\frac{5}{12}$

10. The binomial expansion of $(q+p)^n$ is given by

$(q+p)^n = q^n + {}^nc_1\, q^{n-1}p^1 + {}^nc_2\, q^{n-2}p^2 + \_\_\_\_\_ + {}^nc_r\, q^{n-r}p^r + \_\_\_\_\_ + p^n.$

The mean of binomial distribution is :

(A) npq (B) $\sqrt{npq}$

(C) np (D) nq

11. If m is the mass and E is the total energy of a free particle, the speed v of the particle according to special theory of relativity is :

(A) $v = c\sqrt{1 + \frac{mc^2}{E}}$

(B) $v = c\sqrt{1 - \frac{mc^2}{E}}$

(C) $v = c\sqrt{1 - \frac{mc}{E}}$

(D) $v = c\sqrt{1 - \left(\frac{mc^2}{E}\right)^2}$

12. In case of a linear triatomic molecule of AB_2 type, the relation between the eigen frequencies ω_1, ω_2 and ω_3 can be represented as :

(A) $\omega_1 = \omega_2 = \omega_3$

(B) $\omega_1 = 0,\ \omega_2 = \omega_3$

(C) $\omega_1 = 0,\ \omega_2 \neq \omega_3$

(D) $\omega_1 = \omega_2 \neq \omega_3$

13. For a particle moving under a fixed central force :

(A) the motion of the particle is always on a circular path

(B) its kinetic energy remains constant

(C) its angular momentum is conserved

(D) motion of the particle do not confine to a plane

14. The Lagrangian of a simple pendulum of length l and mass m is :

(A) $L = \frac{1}{2}ml^2\dot{\theta}^2 + mgl\,(1 - \cos\theta)$

(B) $L = ml^2\dot{\theta}^2 + mgl\,(1 - \cos\theta)$

(C) $L = \frac{1}{2}ml^2\dot{\theta}^2 - mgl\,(1 - \cos\theta)$

(D) $L = ml^2\dot{\theta}^2 - mgl\,(1 + \cos\theta)$

15. There are n number of particles of masses each of mass m at distances a, ar, ar^2, ..., ar^n units respectively from origin on the X-axis. The distances of centre of mass of the system from the origin on X-axis for $r \geq 1$ is :

(A) $X_{cm} = \frac{a(r^n + 1)}{n(r - 1)}$

(B) $X_{cm} = \frac{a(r^n + 1)}{n(r + 1)}$

(C) $X_{cm} = \frac{a(r^n - 1)}{n(r - 1)}$

(D) $X_{cm} = \frac{a(r^n - 1)}{n(r + 1)}$

16. Match the following :

	List - I		List - II
(a)	Symmetric top	(i)	$I_1 \neq I_2 \neq I_3$
(b)	Asymmetric top	(ii)	$I_1 = I_2$ and $I_3 = 0$
(c)	Spherical top	(iii)	$I_1 = I_2 \neq I_3$
(d)	Rotator	(iv)	$I_1 = I_2 = I_3$

Codes :

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

17. **Assertion (A) :**

If there is no external force on a system of particles, then the centre of mass will not move.

Reasoning (R) :

If net external force on a system of particles, then the centre of mass will not move.

Codes :

(A) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**

(B) Both **(A)** and **(R)** are true and **(R)** is not the correct explanation of **(A)**

(C) **(A)** is true but **(R)** is false

(D) **(A)** is false but **(R)** is true

18. The vector potential $\overline{A}$ related to the magnetic field $\overline{B}$ by $\overline{B} = \overline{\nabla} \times \overline{A}$. If the magnetic field $\overline{B}$ is along the z - direction, then the components of $\overline{A}$ are :

(A) $A_x = A_y = A_z = 0$

(B) $A_x = -BY, A_y = A_z = 0$

(C) $A_x = -BZ, A_y = BY, A_z = 0$

(D) $A_x = -BX, A_y = BY, A_z = BZ$

19. An insulating sphere of radius 'a' carries a charge density $\rho(\overline{r}) = \rho_0 (a^2 - r^2) \cos\theta$, $r < a$. The leading order term for the electric field at a distance d, far away from the charge distribution, is proportional to :

(A) d^{-1} (B) d^{-2}

(C) d^{-3} (D) d^{-4}

20. The electric flux density passing through a hemispherical surface of radius R placed in a uniform electric field $\vec{E}$ with the axis parallel to the electric field $\vec{E}$.

(A) $2\pi R^2 E$ (B) πRE

(C) $2\pi R^3 E$ (D) $\pi R^2 E$

11. The electrostatic pressure at any point on the surface of a conductor of surface charge density σ is :

(A) σ^3/ϵ_0 (B) $\sigma^2/2\epsilon_0$

(C) σ/ϵ_0 (D) σ^2/ϵ_0

12. A circular loop of radius 'a' carries a uniform linear density of charge. It is set in rotation about its axis with an angular velocity, then the magnetic moment of the rotating loop is proportional to :

(A) a^3 (B) a^2

(C) $a^{3/2}$ (D) a^4

13. Solution of Laplace equation in spherical Polar coordinates contains :

(A) Bessel function

(B) Gamma function

(C) Associated Legendre function

(D) Neumann function

14. A sphere of radius R carries a Polarization $\vec{P}(r) = K\vec{r}$, where K is a constant and $\vec{r}$ is the vector from the center. Then the bound charges :

(A) $\frac{K}{R}$, $3K$ (B) KR, $-3K$

(C) KR^2, $-3K$ (D) K, $-3KR^2$

25. If $\hat{n}$ is the polarization vector and $\hat{k}$ is propagation direction of a plane electromagnetic wave, then :

(A) $\vec{n} = \vec{k}$ (B) $\vec{n} = -\vec{k}$

(C) $\vec{n} \cdot \vec{k} = 0$ (D) $\vec{n} \times \vec{k} = 0$

26. A dielectric material is placed in an electric field E_0. The direction of the depolarization field E_p is :

(A) in the direction of E_0

(B) opposite to E_0

(C) perpendicular to E_0

(D) at an angle to E_0

27. The first excited state of hydrogen atom in four-fold degenerate. The four degenerate states are :

(A) $|200\rangle$, $|201\rangle$, $|211\rangle$, $|12, 1, -1\rangle$

(B) $|200\rangle$, $|210\rangle$, $|121\rangle$, $|211\rangle$

(C) $|200\rangle$, $|210\rangle$, $|211\rangle$, $|121, -1\rangle$

(D) $|100\rangle$, $|200\rangle$, $|211\rangle$, $|121, -1\rangle$

28. The expression for the differential operator $\hat{L}_z$ in spherical polar coordinates is :

(A) $\frac{\partial}{\partial\phi}$ (B) $i\hbar\frac{\partial}{\partial\phi}$

(C) $i\hbar\frac{\partial^2}{\partial\phi^2}$ (D) $-i\hbar\frac{\partial}{\partial\phi}$

29. In linear harmonic oscillator problem, if a^+ and a are creation and annihilation operators, then the commutator $[a, a^+]$ is :

(A) 0 (B) $\hbar\omega a^+$

(C) $\hbar\omega a$ (D) 1

30. Which of the following is **not** true ?

(A) $[L_x, L^2] = 0$

(B) $[L_x, L_y] = i\hbar L_z$

(C) $[L_x, L_z] = i\hbar L_y$

(D) $[L_y, L_z] = i\hbar L_x$

31. If two operators $\hat{A}$ and $\hat{B}$ commute with each other then they :

(A) are equal

(B) have the same eigen values

(C) possess a complete set of simultaneous eigen function

(D) are null operators

32. Let $|\psi_0>$ is the wave function of the ground state. If $|\psi_1>$ be the trial wave function of the excited, then the energy of the excited state can be determined provided :

(A) $<\psi_0|\psi_1> = 0$

(B) $<\psi_0|\psi_1> = 1$

(C) $<\psi_0|\psi_1>$ is not determined

(D) None of these

33. In Dirac notation $|A><B|$ can be represented by a :

(A) C - number

(B) Column matrix

(C) Row matrix

(D) Square matrix

34. If $\psi(x) = \sqrt{\frac{2}{L}} \sin\left(\frac{n\pi x}{L}\right)$ is the wave function of a particle moving along x-axis in the region $0 \le x \le L$ then the expectation value of its momentum is :

(A) zero (B) negative

(C) positive (D) infinity

35. A microcanonical ensemble represents :

(A) a system in contact with heat reservoir

(B) an isolated system in equilibrium

(C) a system that can exchange particles with its surroundings

(D) a system under constant pressure

36. The change in Entropy is :

(A) Positive in a reversible process

(B) Negative in an irreversible process

(C) Positive in an irreversible process

(D) Negative in a reversible process

37. In an isothermal change, the internal energy of molecules :

(A) does not change

(B) increases

(C) decreases

(D) exponentially increases and then abruptly decreases

38. If a given degree of freedom appears quadratically in the Hamiltonian, then the average contribution to the total energy due to this degree of freedom is :

(A) KT (B) $\frac{1}{2}$KT

(C) $\frac{3}{2}$KT (D) $\frac{5}{2}$KT

39. The ensemble average of an operator is given by :

(A) $< A > = \frac{Tr\,(e^{-\beta H} A)}{Tr\,(e^{-\beta H})}$

(B) $< A > = Tr(e^{-\beta H})\ Tr(e^{-\beta H} A)$

(C) $< A > = \frac{Tr\,(e^{-\beta H})}{Tr\,(e^{-A})}$

(D) $< A > = Tr(e^{-\beta H} A)$

40. An ideal gas expands reversibly from volume V_1 to V_2 at a constant temperature. The change in entropy is :

(A) zero

(B) $nRT \ln \left(\frac{V_2}{V_1}\right)$

(C) $nR \ln \left(\frac{V_2}{V_1}\right)$

(D) $\frac{nR}{T} \ln \left(\frac{V_2}{V_1}\right)$

41. Equipartition theorem is valid :

(A) Only in M - B systems

(B) Only in B - E systems

(C) Only in F - D systems

(D) In all systems

42. $S = K_B \ln W$ is the well known Boltzman equation where W is the thermodynamic probability. W can take the values from :

(A) 0 to 1 (B) 0 to ∞

(C) 1 to ∞ (D) $-\infty$ to ∞

43. To have the Tunnel phenomenon in a diode :

(A) n - type fermi level should be below the conduction band and p - type fermi level should be above the valence band

(B) n - type fermi level should be below the conduction band and p - type fermi level should be below the valence band

(C) n - type fermi level should be above the conduction band and p - type fermi level should be above the valence band

(D) n-type fermi level should be above the conduction band and p - type fermi level should be below the valence band

44. Negative feedback in amplifier increases :

(A) gain

(B) distortion

(C) bandwidth

(D) output impedance

45. A counter circuit counts from 0 to 2048. The number of flip flops used are :

(A) 10 (B) 11

(C) 12 (D) 13

46. The output of an exclusive – OR gate is :

(A) $\overline{A}\,\overline{B} + A\,B$

(B) $\overline{A}\,B + A\,\overline{B}$

(C) $\overline{A}\,B + \overline{A}\,\overline{B}$

(D) $A\,\overline{B} + \overline{A}\,\overline{B}$

47. The instruction LXIH, 2050 in 8085 microprocessor means :

(A) Loads 2050 into HL register pair

(B) Loads 2050 into H register

(C) Loads 2050 into L register

(D) Loads 2050 into Accumulator

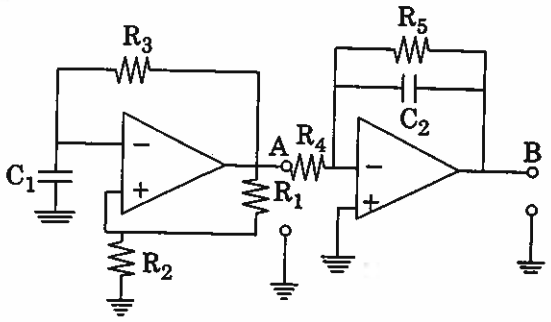
48. Match the **List - I** with **List - II** and choose the **correct** answer :

(a)	MVI A, 2C	(i)	Jump to 2050 if the accumulator content is not zero
(b)	JNC 2050	(ii)	Move immediately 2C to A register
(c)	MOV A, M	(iii)	Jump to 2050 if the carry flag is reset
(d)	JNZ 2050	(iv)	Move the contents of memory to the accumulator

Codes :

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

49. For the given circuit the output waveforms at point A and point B are :



(A) At A = Rectangular wave; at B= Triangular wave

(B) At A = Triangular wave; at B= square wave

(C) At A = Saw-tooth wave; at B= Triangular wave

(D) At A = Triangular wave; at B= Saw-tooth wave

50. A set of readings has a wide range and therefore it has :

(A) Low precision

(B) High precision

(C) Low accuracy

(D) High accuracy

-o0o-

Space For Rough Work

SEAL