Test Paper : **II**

Test Subject : **PHYSICAL SCIENCES**

Test Subject Code : **A-16-02**

Test Booklet Serial No. : _____

OMR Sheet No. : _____

Hall Ticket No. | | | | | | | | | |

(Figures as per admission card)

Name & Signature of Invigilator

Name : _____ Signature : _____

Paper : II

Subject : PHYSICAL SCIENCES

Time : 1 Hour 15 Minutes Maximum Marks : 100

Number of Pages in this Booklet : **8** Number of Questions in this Booklet : **50**

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 Sheet given to you**. If you mark at any place other than in the circle in the 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. You have to return the test question booklet and OMR Answer Sheet to the invigilators at the end of the examination compulsorily and must not carry it with you outside the Examination Hall.
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 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 తేడాలుండుట 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. ప్రతిప్రశ్నకు 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 నిర్ణీత స్థలంలో సూచించవలసిన వివరాలు తప్పించి ఇతర స్థలంలో మీ గుర్తింపును తెలిపే విధంగా మీ పేరు రాయడం గానీ లేదా ఇతర చిహ్నాలను పెట్టడం గాని చేసినట్లయితే మీ అనర్హతకు మీరే బాధ్యులవుతారు.
9. పరీక్ష పూర్తయిన తర్వాత మీ ప్రశ్నపత్రాన్ని మరియు OMR పత్రాన్ని తప్పనిసరిగా పరీక్షాపర్యవేక్షకుడికి ఇవ్వాలి. వాటిని పరీక్ష గది బయటకు తీసుకువెళ్లకూడదు.
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.**

PHYSICAL SCIENCES

Paper – II

1. If ABCD is a rectangle of size 1 X 2, then the angle between the diagonals AC and BD is

(A) $\text{Cos}^{-1}(1/5)$

(B) $\text{Cos}^{-1}(2/5)$

(C) $\text{Cos}^{-1}(3/5)$

(D) $\text{Cos}^{-1}(4/5)$

2. If $A = \begin{bmatrix} a & -2 \\ 3 & b \end{bmatrix}$ has eigen values 2, 3, then a, b are

(A) 2, 3 (B) 4, 1

(C) 6, –1 (D) 5, 0

3. If $\oint \vec{f}.\overrightarrow{dr} = 0$ over a closed curve, then

(A) $\nabla \times \vec{f} = 0$ (B) $\nabla . \vec{f} = 0$

(C) $\vec{v} = \nabla^2 \vec{f}$ (D) $\vec{v} = \nabla \times \vec{f}$

4. If $\vec{f}$ is a vector of constant magnitude, then $d\vec{f}/dt =$

(A) $\vec{f}$

(B) 0

(C) normal to $\vec{f}$

(D) $k\vec{f}$

5. If f(z) = 1/(1 – cos z), then the singularity z=0 is of order

(A) 0 (B) 1

(C) 2 (D) 3

6. If $A = \begin{bmatrix} 1 & -2 \\ 0 & 4 \end{bmatrix}$, A = B + C where B is symmetric, C is skew symmetric, then B =

(A) $\begin{bmatrix} 1 & 1 \\ 1 & 2 \end{bmatrix}$ (B) $\begin{bmatrix} 1 & -1 \\ -1 & 4 \end{bmatrix}$

(C) $\begin{bmatrix} 1/2 & -1 \\ -1 & 2 \end{bmatrix}$ (D) $\begin{bmatrix} 2 & -1 \\ -1 & 1 \end{bmatrix}$

7. $1 + \frac{1}{3^2} + \frac{1}{5^2} + \ldots =$

(A) $\pi/4$ (B) $\pi^2/8$

(C) π (D) π^2

8. If $\begin{cases} 1\,f \text{ or } 0 \le x < \pi \\ -1\,f \text{ or } -\pi \le x \le 0 \end{cases}$, f(x) is expanded in sine series as $f(x) = \sum b_n \sin nx$, then $b_1 =$

(A) $1/\pi$ (B) $2/\pi$

(C) $4/\pi$ (D) 0

9. If f(x) = x for $0 \le x \le 2$, f(x) is expanded in Fourier series, then the constant term in the series is

(A) 0 (B) 1

(C) 2 (D) 3

10. $y'' + y = \sin 2x$, then the particular integral of the solution is

(A) sin2x / 3 (B) cos2x / 3

(C) 2 /3 sin2x (D) –1/ 3 sin2x

11. The distribution whose mean and variance are equal is

(A) Binomial (B) normal

(C) poisson (D) uniform

12. If f(z) is expanded in Taylor series, then the region of convergence is

(A) annular

(B) circular

(C) entire

(D) upper half of z plane

13. If $f(z) = 1/(z-a)$, then the integral $\oint f(z)dz$ over the circle $|z-a| = 1$ is

(A) $2\pi i$ (B) $-2\pi i$

(C) πi (D) 0

14. If $y' + y/x = x$, then the integrating factor of the equation is

(A) e^x (B) x

(C) 1/x (D) Log x

15. If the solutions of a differential equation are nonintersecting, then the differential equation could be

(A) exact (B) homogeneous

(C) nonlinear (D) linear

16. A particle moving under the action of central force, the parameter which remain constant is

(A) Potential energy

(B) Total energy

(C) Angular momentum

(D) None of the above

17. Compound pendulum is a perfectly rigid body oscillating under the force of gravity about

(A) Horizontal axis which does not pass through the center of gravity

(B) Horizontal axis which passes through the center of gravity

(C) Vertical axis passing through the center of gravity

(D) None of the above

18. div B=0, imply that

(A) Magnetic monopoles only occur

(B) Magnetic dipoles only occur

(C) Electric mono and dipole occur

(D) None of the above

19. $\oint B \cdot ds = 0$, imply

(A) Gauss's law of electrostatics

(B) Gauss's law of magnetism

(C) Gauss's law of dielectrics

(D) None of the above

20. Wave packets represent particles having precise values of

(A) Momentum and energy

(B) Position and momentum

(C) Time and energy

(D) None of the above

21. In a quantum oscillator, there is a finite probability of finding the particle outside the

(A) Parabolic potential barrier

(B) Potential well

(C) Potential hill

(D) None of the above

22. A nibble consist of

(A) Two bits (B) Four bits

(C) Eight bits (D) Sixteen bits

23. The diffusion capacitance of a p-n junction is
(A) Inversely proportional to life time of carriers
(B) Directly proportional to life time of carriers
(C) Independent of life time of carriers
(D) None of the above

24. Relativistic kinetic energy is the sum of
(A) Non relativistic kinetic energy and rest mass
(B) Non relativistic kinetic energy and potential energy
(C) Sum of the squares of non relativistic kinetic energy and potential energy
(D) None of the above

25. An autonomous non conservative system is said to be dissipative, then the vibration is known as
(A) Damped vibration
(B) Un-damped vibration
(C) Self oscillatory
(D) None of the above

26. Lagrange's equation of motion is described by
(A) Second order differential equation
(B) Energy consideration not by force
(C) Hamilton's principle of conservative system
(D) All the above

27. In the relativistic generalisation of Newton's laws
(A) Fourth component of force and momentum must be introduced
(B) Differentiation cannot be performed with respect to time
(C) Both A and B are to be considered
(D) None of the above

28. Time dependent Schrodinger wave equation is not relativistically invariant, since
(A) It has first derivative in time
(B) Second derivative in space coordinates
(C) It is relativistically invariant
(D) Both A and B

29. Heisenberg uncertainty principle may be applied to
(A) Determine ground state of Hydrogen atom
(B) Determine width of spectral line
(C) Prove the non-existence of electrons in nucleus
(D) All the above

30. The total energy or Hamiltonian of a poly-atomic molecule is given by
(A) Translational energy
(B) Vibrational energy
(C) Rotational energy
(D) Sum of the all the above energies

31. The Fermi energy level in a semiconductor changes with
(A) n type doping
(B) p type doping
(C) concentration of doping
(D) all the above

32. Ideal operational amplifier has
i) High input impedence
ii) High output impedence
iii) Infinite loop gain
(A) i) and ii) are correct, iii) is wrong
(B) ii) and iii) are correct, i) is wrong
(C) i) and iii) are correct, ii) is wrong
(D) ii) is correct, i) and iii) are wrong

33. Choose the correct options from the following:

i) Weighted resistor and R-2R ladder networks are D/A techniques

ii) Dual slope and successive approximation are A/D techniques

iii) Thermocouple and piezo-electric devices are passive transducers

(A) i) and ii) are correct, iii) is wrong

(B) ii) and iii) are correct, i) is wrong

(C) iii) and i) are correct, ii) is wrong

(D) i) , ii) , iii) are correct

34. Identify the order of invention of the following:

(A) BJT, Diode, FET, Microprocessor

(B) Diode, BJT, FET, Microprocessor

(C) BJT, Diode, Microprocessor, FET

(D) Diode, FET, BJT, Microprocessor

35. Assertion A : Ge, Si cannot be used to construct LEDs

Reason R : Their E_g is small

(A) A and R are true, and R is the correct explanation

(B) A and R are true but R is not the correct explanation

(C) A is true but R is false

(D) A is false but R is true

36. Choose the correct options from the following:

i) The maximum energy of a free electron at 0° K is E_f

ii) The average energy of a free electron at 0° K is (3/5) E_f

iii) The most probable energy of electron in conduction band of semiconductor is (½) KT above the bottom of the band

(A) i) and ii) are correct, iii) is wrong

(B) ii) and iii) are correct, i) is wrong

(C) iii) and i) are correct, ii) is wrong

(D) i) , ii) , iii) are correct

37. SIM refers to

(A) Select interrupt mask

(B) Sorting interrupt mask

(C) Set interrupt mask

(D) None of the above

38. The storage cell in an S RAM is

(A) A flip-flop

(B) A capacitor

(C) A fuse

(D) A magnetic domain

39. The time taken for the data to appear at the data output of ROMchip after an address is applied at the address input lines is

(A) Write time (B) Recycle time

(C) Refresh time (D) Access time

40. Assertion A : The conducting walls of the wave guide confine the electromagnetic fields and thereby guide the electromagnetic wave

Reason R : When the waves travel longitudinally down the guide, the plane waves are reflected from wall to wall

(A) A is true but R is false

(B) Both A and R are true

(C) A is false but R is true

(D) Both A and R are false

41. Luminescence is because of

(A) Photons emitted while excited electrons drops down

(B) Knocking out of electrons by photons

(C) Photons stimulated by photons

(D) All

42. Fluorescence occurs within
(A) 10^{-5} s (B) 10^{-5} ms
(C) 10^{-5} μs (D) 10^{-5} ns

43. The ratio of conduction current density to displacement current density is
(A) $\sigma/\omega\varepsilon$ (B) $\omega/\sigma\varepsilon$
(C) $\varepsilon/\sigma\omega$ (D) $\omega\sigma/\varepsilon$

44. The depth of penetration of EM wave in a conductor
(A) Increases with increase in frequency of the wave
(B) Decreases with increase in conductivity of the material
(C) Increases with increase in permeability of the medium
(D) Independent of all the above

45. Power radiated by an electric dipole is
(A) Directly proportional to the square of the frequency
(B) Inversely proportional to the square of the frequency
(C) Directly proportional to the fourth power of the frequency
(D) Inversely proportional to the third power of the frequency

46. Superposition of two circularly polarised lights having same frequency and amplitude but rotating in opposite directions give rise to
(A) Circularly polarised light
(B) Elliptically polarised light
(C) Plane polarised light
(D) Randomly polarized light

47. When plane polarised EM wave propagates between two parallel conducting plates
I) Tangential component of the electric field must be zero at all points on the wall
II) Tangential component of magnetic field must be zero at all points on the wall
(A) I is wrong and II is correct
(B) II is wrong and I is correct
(C) Both I and II are wrong
(D) Both I and II are correct

48. If V_p , V_g and C are phase velocity, group velocity and free space velocity of EM wave then
(A) $V_p > V_g$
(B) $V_p < V_g$
(C) $(V_p)\,(V_g) = C$
(D) $(V_p)\,(V_g) = C^2$

49. Choose the correct options from the following:
I) Stationary charge produces electric field
II) Moving charge produces magnetic field
III) Change in electric field does not produce magnetic field
(A) I) and II) are correct, III) is wrong
(B) II) and III) are correct, I) is wrong
(C) I) and III) are wrong and II) is correct
(D) I) , II) , III) are correct

50. The magnetic field produced by a wire bent in the form of a parabola carrying current I at its focus, given that d is the distance from the focus to the apex is
(A) μ_0 NI/L
(B) μ_0 I/2 π d
(C) μ_0 I/4 d
(D) μ_0 I/4 π d

Space for Rough Work