Section – B

Physics

Max. Marks 100

Roll No. (In figure)_____

Roll No. (In words)_____

Signature of the candidate _____

Signatures of invigilators. 1. _____ **2.**_____

Attempt all 50 questions, each question carries 02 marks. There is no negative Marking. Please mark the correct answer as A/B/C/D at appropriate place, on the right hand side of the question, in blue or black ink.

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1. The value of a if $\vec{A} = a\hat{i} + \hat{j} + \sqrt{5}\hat{k}$ subtends an angle of $60°$ with $4\hat{i} - 5\hat{j} + \sqrt{5}\hat{k}$ is

   (A) $\sqrt{\frac{2}{3}}$

   (B) $\sqrt{\frac{26}{3}}$

   (C) $\sqrt{\frac{46}{3}}$

   (D) $\sqrt{\frac{35}{3}}$

[ ]

2. If A = − A´, then A will be

   (A) Symmetric

   (B) Skew Symmetric

   (C) Hermitian

   (D) Skew Hermitain [ ]

3. The limit point of the poles of a function f(z) is
   (A) A pole
   (B) A non isolated singularity
   (C) An isolated singularity
   (D) A non isolated essential singularity [ ]

4. If f(D)y = 0 be a linear differential equation with constant coefficients, then its auxiliary equation is
   (A) $f(m^3) = 0$
   (B) f(m) = 0
   (C) f(D – m) = 0
   (D) f(x) = 0 [ ]

5. For geometric series 1 – k + k2 – k3 + …. Which of the following is false?
   (A) The series is convergent if k = $-\frac{1}{3}$
   (B) The series is divergent if k = –3
   (C) The series is oscillatory if k = –3
   (D) The series is divergent if k = –2 [ ]

6. The average of the function f(x) = sin x in the interval (0, π) is
   (A) $\frac{1}{2}$
   (B) $\frac{2}{\pi}$
   (C) $\frac{1}{\frac{\pi}{4}}$
   (D) $\frac{}{\pi}$ [ ]

7. The operator which represents the two variables should commute if the Poisson bracket of two variables has value
   (A) 1
   (B) 0
   (C) ih
   (D) –ih [ ]

8. For attractive inverse square forces, the shape of orbit will be
   (A) Elliptic
   (B) Parabolic
   (C) Hyperbolic
   (D) All of the above [ ]

9. Lorentz transformations assumes
   (A) Space and time both are relatives
   (B) Space is relative, but time is absolute

(C) Space is absolute, but time is relative
(D) Space and time are both absolute [ ]

10. There are six particles lying on a plane. The degrees of freedom associated with them are
(A) 6
(B) 12
(C) 18
(D) None of these [ ]

11. The force which is always directed away or towards a fixed center and magnitude of which is a function only of the distance from the fixed centre is known as
(A) Central force
(B) Coriolis force
(C) Centrifugal force
(D) Centripetal force [ ]

12. A passenger in a supersonic jet liner tosses a coin vertically upwords. The coin will fall
(A) Behind him
(B) In front of him
(C) In his hand
(D) He is unable to toss the coin [ ]

13. When a negative charge is placed at the center of the sphere, then the direction of electric on the Gaussian surface is
(A) Radically outward
(B) Radically inward
(C) Along the tangent to the sphere
(D) None of the above [ ]

14. The displacement current arises due to -
(A) Positive charges only
(B) Negative charges only
(C) Both positive [ ]

15. Magnetic vector potential due to magnitude dipole is proportional to
(A) r
(B) r^{-1}
(C) r^{2}
(D) r^{-3} [ ]

16. When angle of incidence is greater than brewster's angle, the reflected ray suffers a phases change of
(A) π
(B) $\pi/2$

(C) 0
(D) 2π [ ]

17. The electric field is
(A) Normal
(B) Tangential
(C) Opposite
(D) Unrelated to the electric exponential lines [ ]

18. The magnitude of electric induction depends on
(A) The applied field alone
(B) The die electric polarization
(C) The applied field as well as die electric polarization
(D) None of these [ ]

19. For an anisotropic dielectric media, the relative permittivity is a
(A) Scalar quantity
(B) Vector quantity
(C) Tensor quantity
(D) None of these [ ]

20. Which of the following is not a fermion?
(A) Electrons
(B) Muons
(C) Neutronws
(D) Photon [ ]

21. The expectation value of a hermit ion operator is always
(A) Same
(B) Conjugate
(C) Negative
(D) Real [ ]

22. The wave function of a particle in classically forbidden region is
(A) The negative exponential
(B) A sine function
(C) Cosine function
(D) A positive exponential [ ]

23. A particle is confined to the region $0 < x < L$, in one dimension. If the particle is in the first exceted state then the probability of finding the particle is maximum at
(A) $x = L/6$
(B) $x = L/2$
(C) $x = L/3$
(D) $x = L/4$ and $3L/4$ [ ]

24. For n = 3, the degenerate eigen function of hydrogen atoms are
    (A) 9
    (B) 18
    (C) 10
    (D) 20 [ ]

25. The Born's approximation is applicable for
    (A) High energy, low atomic number for scatterer
    (B) low energy, low atomic number for scatterer
    (C) High energy, high atomic number for scatterer
    (D) low energy, high atomic number for scatterer [ ]

26. In a heat engine, the maximum heat that can be converted into mechanical work
    (A) depends upon friction
    (B) depends upon working temperatures
    (C) is 100%
    (D) depends upon the working [ ]

27. The enthalpy pf unit mass for any system is
    (A) H = U + PV + S
    (B) H = U + PV – S
    (C) H = U + PV
    (D) None of these [ ]

28. The mean translational kinetic energy per molecule of an ideal gas is
    (A) KT
    (B) $\frac{1}{2}$ KT
    (C) $\frac{3}{2}$ KT
    (D) $\frac{2}{3}$KT [ ]

29. Specific heat of metals can be expressed as
    (A) T^3
    (B) $AT + BT^2$
    (C) $AT^2 + BT^3$
    (D) $AT + BT^3$ [ ]

30. The potential energy of the molecules of ideal gas is
    (A) Equal to their K.E.
    (B) Equal to the internal energy
    (C) Zero
    (D) Equal to the external work [ ]

31. 1 gm of ice is melted and converted to water at 0° C. The change in its entropy is
(A) Zero
(B) 80 cal/gm
(C) 0.29 deg-gm
(D) 10 cal/deg [ ]

32. Thermal radiations are
(A) Infra red radiations
(B) Uv radiations
(C) Gamma radiations
(D) None of these [ ]

33. Maxwell's inductance-capacitance bridge is used for measurement of induction of
(A) Low Q Coils
(B) Medium Q Coils
(C) High Q Colis
(D) Low and medium Q Coils [ ]

34. In a CRT the focusing a node is located
(A) Between pre-accelerating and accelerating nodes
(B) After accelerating node
(C) Before pre accelerating node
(D) None of the above [ ]

35. An 8 bit converter is used for a d.c. range of 0-10V. Find the weight of LBS
(A) 39mV
(B) 78mV
(C) 39.2mV
(D) None of these [ ]

36.LEDs emit light
(A) Only in red color
(B) Only in yellow color
(C) Only in green color
(D) In green, red, yellow and amber color [ ]

37. The sign of the current carrying charge is determined by
(A) Faraday effect
(B) Hall effect

(C) Effective mass
(D) Forbidden energy gap [ ]

38. A rack salt prism spectrograph is used in
(A) Visible region
(B) Ultraviolet region
(C) Infrared region
(D) None of these [ ]

39. Temperature coefficient of carbon resestors is
(A) Zero
(B) Positive
(C) Negative
(D) Both positive [ ]

40. When operated is cut off and saturation, the transistor acts like a
(A) Linear amplifier
(B) Switch
(C) Variable capacitor
(D) Variable resistor [ ]

41. Wien bridge oscillators are based on
(A) Positive feedback
(B) Negative feedback
(C) Piezoelectric effect
(D) High gain [ ]

42. Square wave response of an amplifier shows its behavior at
(A) Low frequencies
(B) High frequencies
(C) Both low and high frequencies
(D) None of these [ ]

43. In an integrator, the feedback element is
(A) Resistor
(B) Capacitor
(C) Zenor diode
(D) Voltage divider [ ]

44. The lowest frequency passed by a low passed filter is
(A) 1 Hz
(B) 0 Hz

(C) 10 Hz
(D) Depend on the critical frequency [ ]

45. When an Electron jumps from the forth orbit to the second orbit, one gets
(A) First line of pfund series
(B) Second line of Lyman series
(C) Second line of Paschen series
(D) Second Line of Balmer Series [ ]

46. The doublets observed in alkali spectra are due to
(A) Screening of k electrons
(B) Spin orbit interaction of the electrons
(C) Pressure of isotopes
(D) None of these [ ]

47. What is the wave length of the photon emitted by hydrogen atom in transition 2S → 1S?

(A) 2181Å
(B) 1218Å
(C) 1000Å
(D) 2120Å [ ]

48. Which one of the following molecules does not exhibit a rational spectrum?
(A) H2
(B) CO
(C) HCL
(D) HBr [ ]

49.The spectrum of solid atom can be explained by considering
(A) J-J coupling
(B) Relativistic correction
(C) L-S coupling
(D) Heitter –London theory [ ]

50. In normal Zeeman Effect, the d-energy level is split into
(A) 3
(B) 4
(C) 5
(D) 6 [ ]