126/2014

1. The maximum number of distinct Eigen values possessed by a n-rowed square matrix is :
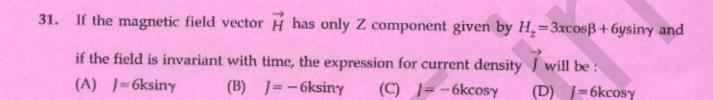   (A) n (B) n^2 (C) $2n$ (D) $(n+1)$

2. P being a vector function, $\nabla.(\nabla \times P)$ equals :
   (A) $|P|$ (B) $\nabla.P$ (C) $\nabla \times P$ (D) 0

3. The complex function $f(z)$ ceases to be analytic at $z = z_0$ then z_0 is a :
   (A) singularity   (B) residue   (C) pole   (D) domain

4. Tensor of the first rank is called :
   (A) Scalar   (B) Vector
   (C) Kronecker tensor   (D) Alternate tensor

5. If $L_n(x)$ is the Laguerre polynomial of order n, the value of $L_0(x)$ is :
   (A) 0   (B) 1   (C) $(1-x)$ (D) $(x-1)$

6. P and Q are the vectors with values $P = 2i + 3j + 4k$ and $Q = i + 2j + k$. The vector $P \times Q$ is :
   (A) $5i - 2j - k$ (B) $5i + 2j - k$ (C) $-5i + 2j + k$ (D) $-5i - 2j + k$

7. A complex function $f(z)$ satisfies Cauchy-Riemann conditions. $f(z)$ is :
   (A) divergent   (B) convergent   (C) continuous   (D) analytic

8. The set of all integers form a group under _____ composition.
   (A) addition   (B) multiplication   (C) division   (D) none of these

9. The set $\{1, -1, i, -i\}$ forms a group under multiplication. Then _____ is a generator of the group.
   (A) 1   (B) -1 (C) i (D) none of these

10. If $\Gamma(n) = \int_0^\infty t^{n-1} e^{-t}\, dt$, for $n > 0$, then $\Gamma(5)$ equals :
    (A) 120   (B) 24   (C) 600   (D) 25

11. A rigid body is an example for a system of particles with _____ constraints.
    (A) Scleronomic and Rheonomic   (B) Scleronomic and Holonomic
    (C) Rheonomic and Holonomic   (D) Rheonomic and Nonholonomic
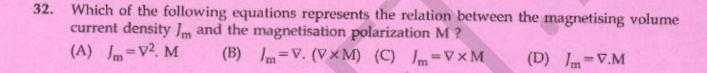
A   3   [P.T.O.]

12. Three point masses are connected by three identical springs with spring constant 'k'. The number of degrees of freedom of the system is :

   (A) 9   (B) 6   (C) 8   (D) $9-k$

13. In the case of a simple pendulum, the Lagrangian is given by $L = ml^2\theta^2 + mgl\cos\theta$. The angular acceleration of the bob will be :

   (A) $-\dfrac{g}{l}$ (B) $-\dfrac{g}{l}\cos\theta$ (C) $+\dfrac{g}{l}\cos\theta$ (D) $-\dfrac{g}{l}\sin\theta$

14. A particle of mass 'm', charge 'q' and linear momentum 'P' enters an electromagnetic field of vector potential 'A' and scalar potential ϕ. The Hamiltonian of the particle is :

   (A) $\dfrac{1}{2m}\left(P - \dfrac{q}{c}A\right)^2$ (B) $\dfrac{1}{2m}\left(P - \dfrac{q}{c}A\right) + q\phi$

   (C) $\dfrac{1}{2m}\left(P - \dfrac{q}{c}A\right)^2 + q\phi$ (D) $\dfrac{1}{2m}\left(P - \dfrac{q}{c}A\right)^2 - q\phi$

15. In the case of two coupled pendula of mass 'm' and length 'l' connected to a massless spring having spring constant 'k', the resonant frequencies are $\sqrt{\dfrac{g}{l}}$ and _____ .

   (A) $\sqrt{\dfrac{g}{l} - \dfrac{2k}{m}}$ (B) $\sqrt{\dfrac{g}{l} + \dfrac{2k}{m}}$ (C) $\sqrt{\dfrac{g}{l} - \dfrac{2m}{k}}$ (D) $\sqrt{\dfrac{g}{l} + \dfrac{2m}{k}}$

16. A nucleus emits a gamma ray photon of frequency 'v'. The loss of internal energy by the nucleus is :

   (A) hv (B) $< hv$ (C) $> hv$ (D) $2hv$

17. If 'm_0' is the rest mass of electron, the relativistic mass approaches _____ as the velocity of electron approaches velocity of light.

   (A) zero   (B) m_0 (C) $2m_0$ (D) infinity

18. If a function 'F' does not depend on time and is a constant of motion, its Poisson bracket with _____ vanishes.

   (A) Hamiltonian   (B) Jacobian   (C) Lagrangian   (D) D'Alembertian

19. _____ is a geometrical object or set with non-integral dimensions which exhibits the property of self similarity.

   (A) Chaos   (B) Fractal
   (C) Attractor   (D) Lyapunov exponent

20. The term _____ is generally used in the non-linear dynamics to describe the sudden change in the behaviour of the system as one or more control parameters are varied.
    (A) logistic map   (B) limit cycle   (C) bifurcation   (D) strange attractor

21. The hydrogen atom is in *d* state. For this state the value of "m" are :
    (A) $-3, -1, 0, 1, 3$ (B) $-2, -1, 0, 1, 2$ (C) $0, 1, 2$ (D) $-1, 0, 1$

22. The wavelength λ associated with a particle of mass 'm' moving with velocity 'v' is given by :
    (A) $\lambda = hv/m$ (B) $\lambda = mhv$ (C) $\lambda = h/mv$ (D) $\lambda = hm/v$

23. According to Schrodinger a particle is equivalent to a :
    (A) Light wave   (B) Wave packet   (C) Photon   (D) Phonon

24. The uncertainty in the location of a particle is equal to de-Broglie wavelength, then the uncertainty in its velocity is :
    (A) $v/2$ (B) v (C) $3v/2$ (D) 0

25. The zero point energy of one dimensional oscillator is :
    (A) $\hbar\omega$ (B) 0 (C) $\frac{1}{2}\hbar\omega$ (D) $\frac{3}{2}\hbar\omega$

26. The wave function in the ground state of hydrogen atom is $\psi = Ae^{-r/a}$, where r measures distance from the nucleus and a is constant. The value of A is :
    (A) $\frac{1}{\sqrt{\pi a3}}$ (B) $\sqrt{\frac{\pi}{a}}$ (C) $\frac{2\pi}{\sqrt{a}}$ (D) $\frac{\pi}{a}$

27. Eigen value of the particle exchange operator is/are :
    (A) 0 (B) -1 (C) $+1$ (D) ± 1

28. Position and momentum operator satisfy $\left[\hat{x}, \hat{p}\right] = i\hbar$. Then the value of $\left[\hat{p}, \left[\hat{x}, \hat{p}\right]\right]$ is :
    (A) 1 (B) 0 (C) $2\hbar^2$ (D) $\frac{\hbar}{2}$

29. The quantum numbers of an energy state for the electron in a cubical box is (1, 2, 3). This is :
    (A) A three fold degenerate energy state
    (B) A two fold degenerated energy state
    (C) A six fold degenerate energy state
    (D) A non degenerate state

A   5   126/2014

30. The Fermi Golden rule of time dependent perturbation gives the transition per unit time of :
   (A) Perturbed Hamiltonian from one stationary state to another
   (B) Perturbed Hamiltonian from one stationary state to a group of states
   (C) Perturbed Hamiltonian from a group of states to another group of states
   (D) None of these

31. If the magnetic field vector $\vec{H}$ has only Z component given by $H_z = 3x\cos\beta + 6y\sin\gamma$ and
   if the field is invariant with time, the expression for current density $\vec{J}$ will be :
   (A) $J = 6k\sin\gamma$ (B) $J = -6k\sin\gamma$ (C) $J = -6k\cos\gamma$ (D) $J = 6k\cos\gamma$

32. Which of the following equations represents the relation between the magnetising volume current density J_m and the magnetisation polarization M ?
   (A) $J_m = \nabla^2 . M$ (B) $J_m = \nabla . (\nabla \times M)$ (C) $J_m = \nabla \times M$ (D) $J_m = \nabla . M$

33. Poynting theorem relating the electric intensity $\vec{E}$, magnetic intensity $\vec{H}$ and the rate of energy flow per unit area at a point gives poynting vector P as equal to :
   (A) $\vec{E} \times \vec{H}$ (B) $\vec{E} . \vec{H}$ (C) $\nabla . \vec{E} \times \vec{H}$ (D) $\vec{E} . \nabla \times \vec{H}$

34. For propagation of electromagnetic wave in a good conductor, the value of :
   (A) $\alpha = \sqrt{\omega\mu\sigma/2}$, $\beta = 180$ (B) $\alpha = \sqrt{2\omega\mu\sigma}$, $\beta = 90$
   (C) $\alpha = \beta = \sqrt{\epsilon\mu}$ (D) $\alpha = \beta = \sqrt{\omega\mu\sigma/2}$

35. When EM waves are propagated in a rectangular waveguide :
   (A) they travel along the broader walls of the waveguide
   (B) they travel through the di-electric without touching the walls
   (C) they travel along all the four walls of the waveguide
   (D) they are reflected from the walls but do not travel along the walls

36. During an adiabatic process at constant pressure, the temperature and volume of a gas are found to vary according to the relation $TV^{0.4}$ = constant. The gas should be a :
   (A) monoatomic gas   (B) diatomic gas
   (C) triatomic gas   (D) could be any of the above

37. The entropy change for a perfect gas is :
    (A) always positive
    (B) a function of temperature only
    (C) Δ_{qH}/T
    (D) a thermodynamic property depending upon temperature and pressure

38. Gibbs free energy G is given by :
    (A) $G = H + T_S$ (B) $G = H/T_S$ (C) $G = J - H_S$ (D) $G = H - T_S$

39. There are a large number of particles each of mass 0.1 gm. All lying in a box at an equilibrium temperature of 300 K. The probability that any one of them will fly to a height 1 A (Use MB statistics) is :
    (A) 0 (B) 1 (C) 1/2 (D) 1/4

40. The entropy change in 1000 gm water heated from 293 K to 353 K is (Sp. heat of water 4.2 J/gm – C) :
    (A) 7.82 J/K (B) 0.782 J/K (C) 782 J/K (D) 7820 J/K

41. If the ground state of chlorine is $^2P_{3/2}$, then the number of substates associated when this state splits in a weak magnetic field will be :
    (A) One (B) Two (C) Four (D) Six

42. The entity that must change during the course of molecular vibration for exhibiting Raman effect is :
    (A) Frequency   (B) Polarizability
    (C) Susceptibility   (D) None of the above

43. A technique which is gaining recognition as a powerful accurate spectroscopic method involving both the NMR and ESR processes is :
    (A) Double resonance   (B) Hyperfine splitting
    (C) Isomer shift   (D) Quadrupole splitting

44. If the wavelength of sodium light is 5890 Å and the number of oscillations corresponding to coherence length is 50,000, then coherence length of the given light will be :
    (A) 0.118 Å (B) 0.0589 m (C) 0.169 Tm (D) 0.0295 m

45. A Wigner-Seitz primitive cell in the reciprocal lattice is called :
    (A) Bravais lattice   (B) Brillouin zone
    (C) Structure factor   (D) Miller indices

A   7   126/2014
                                                                  [P.T.O.]

46. The measurement of Hall voltage in the study of Hall effect gives valuable information about the :

   (A) Mobility of charge carriers
   (B) Structure of charge carriers
   (C) Nature of charge carriers
   (D) Sign of charge carriers

47. By Debye approximation, the phonon heat capacity in the low temperature limit is :

   (A) Directly proportional to the absolute temperature
   (B) Inversely proportional to the absolute temperature
   (C) Directly proportional to the square of absolute temperature
   (D) Inversely proportional to the square of absolute temperature

48. Above Debye's temperature, the ratio of thermal to electrical conductivities is directly proportional to absolute temperature. This law was stated by :

   (A) Wiedemann and Franz's
   (B) Lorentz and Drude
   (C) Maxwell and Botlzmann
   (D) Rayleigh and Jean's

49. Superconducting Quantum Interferences Devices are used to detect :

   (A) High temperature in Ceramic Superconductor
   (B) Cooper pairs tunneling through the Josephson junction
   (C) Weak magnetic field produced by biological currents in the brain of living organisms
   (D) Superconductivity at very low temperatures

50. The BCS theory accounts for a superconducting state formed from pairs of electrons $k \uparrow$ and $-k \downarrow$. These pairs will act as :

   (A) Leptons   (B) Bosons   (C) Fermions   (D) Hyperons

51. A standard man, who contains 18% of carbon, the micro curies of C^{14} present in a 80 kg man is :

   (A) 1.04   (B) 0.104   (C) 10.4   (D) 0.0104

52. The nuclear isomerism arises because of :

   (A) the delayed emission of γ rays by the nuclei
   (B) the delayed emission of β particles by the nuclei
   (C) the interaction of β particles with γ ray
   (D) none of these

[P.T.O.]

53. The most common V particles ($\wedge^0$) is neutral and decays in 2.5×10^{-10} sec. If $\wedge^0$ can interact strongly, why can it not interact with a life time of 10^{-23} sec instead of 10^{-10} sec ?
    (A) because they associate with the creation of strange particles and they immediately decay
    (B) because they are produced in pairs, each one decays into ordinary particles through weak interactions
    (C) because the quantity hyper charge is conserved in strong interaction
    (D) because the quantity strangeness remains constant in fast particle reaction

54. How much U^{235} and U^{238} will be lost in 1 year by α decay ?
    (A) 9.8, 16.2 μg (B) 15.2, 7.0 μg (C) 6.87, 0.774 μg (D) 7.0, 15.2 μg

55. In liquid drop model, if A, Z and N are mass, atomic and neutron numbers respectively, then the deficit in binding energy is proportional to :
    (A) $A - Z/N$ (B) $(N-Z)^2/A$ (C) $(A-2Z)^2/A$ (D) both (B) and (C)

56. The frequency response of an op amp is indicated by plotting :
    (A) the magnitude of transfer gain
    (B) the phase-lead angle as a function of frequency
    (C) both (A) and (B)
    (D) none of these

57. The h parameters of an npn transistor are $h_{ie} = 1000\ \Omega$, $h_{re} =$ negligible, $h_{fe} = 60$ and $h_{oe} = 1.2 \times 10^{-6}$ mho, the power gain for a CE amplifier if $R_L = 10000\ \Omega$:
    (A) 4.556 dB (B) 44.56 dB (C) 0.4456 dB (D) 445.6 dB

58. If $\wedge$ is the time delay in a shift register with clock period T, the pulse train at the output of an 'n' register is delayed by :
    (A) $(T-n)/\wedge$ (B) $n-T/\wedge$ (C) $(n-T/2\wedge)$ (D) $(n-1)T$

59. The parameter which measures the performance of FET is :
    (A) trans conductance (B) drain current
    (C) gate voltage (D) input resistance

60. Though connecting solar cells in parallel will yield high current, the significant problem exist with the parallel connection is :
    (A) the drift current produced will cause a power loss
    (B) the low value of fill factor may reduce the power because of reverse biasing
    (C) the shadow effects will cause power loss because of reverse bias applied by their illuminated cells
    (D) none of these

61. Graphene is a :
    (A) Wide band gap semiconductor
    (B) Gapless band semiconductor
    (C) A narrow band gap semiconductor
    (D) Not a semiconductor, but behaves like graphite

62. Calculate the quantum mechanical zero point energy of an electron within a one dimensional box of length 1 nm :
    (A) 6.0×10^{-20} J   (B) 2×10^{-20} J   (C) 0 J   (D) 6×10^{-19} J

63. In a nano tube, carbon atoms are arranged in the shape of :
    (A) Hollow cylinder (B) Flat layers   (C) A crystal   (D) Geodesic dome

64. Which of the following is a non-conventional energy source ?
    (A) Diesel   (B) Coal   (C) Natural Gas   (D) Atomic energy

65. An important feature of big bang cosmology that is supported by observational astronomy is that the universe :
    (A) Is increasing its total mass over time
    (B) Contains a large amount of darkmatter
    (C) Is expanding at an accelerating rate
    (D) Formed from an earlier collapsed universe

66. Einstein's General theory of relativity states that :
    (A) Gravity and acceleration are equivalent
    (B) Physics for accelerated and non accelerated frames are not the same
    (C) Physics for moving and non moving frames are not the same
    (D) The speed of light is constant

67. What is coherence ?
    (A) It is when information is sent error free
    (B) It is a measure of the reliability of a quantum computer's output
    (C) It is a measure of the compatibility between quantum computers
    (D) It is when a qubit is in both '0' and '1' states simultaneously

68. Which is a polynomial mapping of degree two ?
    (A) Horse shoe map   (B) Logistic map
    (C) Rossler map   (D) Henon map

69. Which statement is true ?
   (A) The electrical conductivity of a metal increases with temperature
   (B) The resistivity of a semiconductor increases with temperature
   (C) The electrical conductivity of a semiconductor increases with temperature
   (D) Metals and semiconductors have similar electrical conducting properties

70. If a fullerene molecule consists of 60 carbon atoms, then how many molecules will be present in 12 g fullerene ?
   (A) 6.023×10^{23}
   (B) 1.0038×10^{23}
   (C) 6.023×10^{22}
   (D) 1.0038×10^{22}

71. A good scientific research is characterized by :
   (A) It requires clear articulation of a goal
   (B) It follows specific plan and procedure
   (C) It accepts certain critical assumptions
   (D) All the above

72. To understand human behavior and reasons over a long period of time one has to do :
   (A) Historical study
   (B) Quasi experimental study
   (C) Longitudinal study
   (D) Cross sectional study

73. Teaching and learning arrangements, usually in small groups, that are structured to produce active participation in learning is :
   (A) Symposium
   (B) Seminar
   (C) Conference
   (D) Workshop

74. Directly useful application of scientific principles to production is called :
   (A) Knowledge
   (B) Science
   (C) Technology
   (D) Research

75. Which of the following qualities a researcher must have ?
   (A) Curious about the world
   (B) Logical and systematic
   (C) Intellectually honest
   (D) All the above

76. The most effective teaching method that ensures maximum participation of students is :
   (A) Lecture method
   (B) Text book method
   (C) Discussion method
   (D) Demonstration method

77. Which of the following is the most important indicator of quality of education in a school ?
   (A) Infrastructural facilities
   (B) Qualification of teachers
   (C) Discipline maintained in the school
   (D) Students' achievements

78. Which of the following is not a quality of effective teacher ?
    (A) Less interaction in the class
    (B) Adopt interactive method of teaching
    (C) Reduce the anxiety level of students
    (D) Motivate the students to take initiative

79. Which of the following can be achieved through value education ?
    (A) To inculcate of virtues   (B) Develop job skills
    (C) Aware on physical fitness   (D) Development of personality

80. Teaching method where purposeful activity that will remove a recognized difficulty or perplexity in situation through the process of reasoning is :
    (A) Inquiry method   (B) Problem solving method
    (C) Reflective method   (D) None of the above

81. _____ of The Constitution of India directs the State to organize village panchayats and endow them with powers and authority to function as units of self-governments.
    (A) Article 39   (B) Article 40   (C) Article 42   (D) Article 46

82. Article _____ of The Constitution of India imposes a duty upon citizens to uphold and protect the sovereignty, unity and integrity of India.
    (A) 51-A(b)   (B) 51-A(j)   (C) 51-A(c)   (D) 51-A(f)

83. All-India services can be created by The Parliament as empowered under _____ of The Constitution of India.
    (A) Article 312   (B) Article 312-A   (C) Article 313   (D) Article 310

84. Freedom as to payment of taxes for promotion of any particular religion is guaranteed under Article _____ of The Constitution of India.
    (A) 26   (B) 27   (C) 28   (D) 29

85. In Sodan Singh v New Delhi Municipality AIR 1989 SC 1988, The Supreme Court was called upon to decide whether _____.
    (A) Municipal authorities can impose restrictions on slaughter houses under Article 19(6)
    (B) Employees had a fundamental right to resort to strike without notice
    (C) Local authorities can levy a tax retrospectively
    (D) Hawkers had a fundamental right to carry on their trade on pavements meant for pedestrians

86. First appeal under Section 19(1) of The Right to Information Act 2005 has to be preferred within _____ days from the expiry of period for receipt of information or from date of decision.

    (A) fifteen   (B) thirty   (C) forty-five   (D) sixty

87. As per Section 4(1)(c) of The National Green Tribunal Act 2010, The Tribunal shall consist of a minimum of _____ full-time expert members.

    (A) five   (B) twenty   (C) fifteen   (D) ten

88. As per Section 22(1)(b) of The Transplantation of Human Organs Act 1994, no court shall take cognizance of an offence except on complaint filed by a person who has given notice of not less than _____ days to the Appropriate Authority, of the alleged offence and his intention to make the complaint.

    (A) thirty   (B) sixty   (C) ninety   (D) fifteen

89. As per Section 10(1) of The Scheduled Castes and Scheduled Tribes (Prevention of Atrocities) Act 1989, a special court can pass an externment order against a person likely to commit offence, and direct him not to return to the concerned area for such period not exceeding _____ as may be specified in the order.

    (A) six months   (B) one year   (C) two years   (D) five years

90. According to Rule 2(j) of The Noise Pollution (Regulation and control) Rules 2000, 'Night Time' has been defined as the period between _____.

    (A) 10 pm and 6 am   (B) 10 pm and 5 am
    (C) 10 pm and 7 am   (D) 9.30 pm and 6.30 am

91. Who was the founder of 'Sadhu Jana Paripalana Sangham' ?
    (A) Sree Narayana Guru   (B) Ayyankali
    (C) Chattampi Swamikal   (D) Sahodaran Ayyappan

92. The social organisation in Kerala, 'Samathwa Samajam' was established in the year :
    (A) 1836   (B) 1851   (C) 1855   (D) 1898

93. Which among the following is not written by G. Sankara Kurup ?
    (A) Suryakanthi   (B) Nimisham
    (C) Viswa Darsanam   (D) Kunnimanikal

94. Author of the famous book 'Jaathikkummi' :
    (A) K.P. Karuppan   (B) T.R. Krishnaswami Iyer
    (C) P.K. Chattan Master   (D) K.P. Vellon

95. The Renaissance leader in Kerala, who got the name 'Kumara Guru' :
    (A) Mampuram Thangal   (B) Pampadi John Joseph
    (C) Poikayil Yohannan   (D) Moorkoth Kumaran

96. The name given to the Airforce's rescue operation provided to the flood victims of Uttarakhand :
    (A) Operation Surya Hope   (B) Operation Rahat
    (C) Operation Ganga Prahar   (D) Operation Blossom Spring

97. Which year has formally declared by UN General Assembly as 'International year of family farming' ?
    (A) 2014   (B) 2010   (C) 2006   (D) 2009

98. The commission appointed for studying the contributory pension system in Kerala :
    (A) Ranga Rajan Commission   (B) Hazari Commission
    (C) Sree Krishna Commission   (D) Bhattacharya Commission

99. Which Constitutional Amendment incorporated Panchayati Raj System in our constitution ?
    (A) 43rd Amendment   (B) 74th Amendment
    (C) 73rd Amendment   (D) 44th Amendment

100. The nodal agency for estimation of poverty at the national and state level in India :
    (A) Rural Ministry   (B) Planning Commission
    (C) Finance Commission   (D) Home Ministry

- o 0 o -