

51. For the matrix given below, the sum of the eigen values is
 a) 4 b) 6 c) 7 d) 11
52. The complex function $f(z) = x^2 + iy^2$ is analytic at
 a) all points in the complex plane
 b) no point on the complex plane
 c) at all points where $y = x$
 d) at all point where $y^2 = x$
53. Poles of the function $f(z) =$ are at
 a) $z = 3$ b) $z = -3$ c) $z = -3i$ d) $z = \pm 3i$
54. In the Fourier expansion of the output of a full wave rectifier, the value of a_0 is (assume that the maximum amplitude is V)
 a) V b) πV c) $2V/\pi$ d) V/π
55. When $s > a$, the Laplace transform of e^{st} is
 a) b) c) d)
56. A wave function can be given as an expansion of its eigenfunctions. These eigen functions are said to be orthonormal because, they should form a
 a) complete set of functions which can be partly independent
 b) complete set of independent functions
 c) set of normalized functions
 d) complete set of normalized functions
57. A particle moves by 5 m in a force field is given by $F = 2$, then the work done is
 a) 0.5 units b) 2 units c) 8 units d) no work is done
58. As per Bragg law, we expect a peak at 30° in a crystal. But, no peak could be observed at that angle because
 a) The XRD instrument may be faulty
 b) Bragg law is not the sufficient condition to observe diffraction
 c) the crystal may not be mounted properly
 d) x-ray intensity may not be sufficient
59. In the diamond structure, the basis is given by
 a) $(000), (\frac{1}{4}\frac{1}{4}\frac{1}{4})$ b) $(000), (\frac{1}{4}\frac{1}{4}\frac{1}{4})$
 c) $(000), ()$ d) $(000), (111)$
60. A specific concentration of Arsenic atoms were added to a semiconductor. This addition would cause,
 a) the concentration of both electrons and holes to decrease

- b) the concentration of electrons to increase but, the concentration of holes would decrease
- c) the concentration of holes to increase while that of electrons would decrease
- d) the concentration of holes to remain unaffected

61. When there is spontaneous magnetization in a material, it is said to be a
- a) paramagnetic material
 - b) diamagnetic material
 - c) ferromagnetic material
 - d) antiferromagnetic material
62. An LED made of a semiconductor give out light of 500 nm, then the band gap of the semiconductor employed is
- a) 1.0 eV
 - b) 2.0 eV
 - c) 2.5 eV
 - d) 3.5 eV
63. The full scale voltage of an 10 bit digital to analog converter is 5.12 V. The value of one LSB is
- a) 5 mV
 - b) 10 mV
 - c) 20 mV
 - d) 40 mV
64. A counter type 10 bit analog to digital converter operates at a clock of 1 MHz. The average conversion time of the ADC is
- a) 128 μ s
 - b) 256 μ s
 - c) 512 μ s
 - d) 1024 μ s
65. It is desired to build a mod- 167 asynchronous counter. How many flip-flops are needed?
- a) 7
 - b) 8
 - c) 9
 - d) 10
66. The counter that counts in the sequence 0,1,3,7,15,14,12,8,0 is known as
- a) an asynchronous counter
 - b) a synchronous counter
 - c) shift counter
 - d) up-down counter
67. In a material under thermal equilibrium, the probability of stimulated emission to spontaneous emission in a system under thermal equilibrium is
- a) 10^{40}
 - b) 10^{-40}
 - c) 10^{20}
 - d) 10^{-20}
68. The property of a laser that is employed in measuring long distances is
- a) monochromatic nature
 - b) Coherent nature
 - c) high intensity
 - d) directionality

69. The reason for the high intensity of a laser beam is
- monochromatic nature
 - Coherence
 - both monochromatic nature and coherence
 - none of the above
70. Molecules like oxygen and nitrogen do not yield any IR spectrum on account of their
- not having any permanent electric dipole moment
 - not having any permanent magnetic dipole moment
 - not having any permanent electric quadrupole moment
 - not having any permanent magnetic quadrupole moment
71. The principle behind Fourier transform spectrometers is that they
- make measurements in time domain and transform to obtain the spectrum in the frequency domain
 - make measurements in frequency domain and transform to obtain the spectrum in the time domain
 - make measurements in wavelength domain and transform to obtain the spectrum in the frequency domain
 - make measurements in time domain and transform to obtain the spectrum in the wavelength domain
72. To electromagnetic radiation used in NMR spectrometers use
- IR radiation
 - Visible radiation
 - microwaves
 - radio waves
73. The $A^{1/2}$ term in the semi empirical mass formula corresponds to
- Coulomb energy
 - Pairing energy
 - kinetic energy
 - potential energy
74. The ratio of the diameter of two nuclei of mass number 27 and 64 is
- 2: 8
 - 3:4
 - 4:2
 - 4:3
75. The energy released per fusion reaction in a stellar cycle is
- 26.7 eV
 - 26.7 keV
 - 26.7 MeV
 - 26.7 GeV
76. The energy liberated in a pair annihilation is
- 1.022 eV
 - 1.022 keV
 - 1.022 MeV
 - 1.022 GeV
77. The beta spectrum of a nucleus consists of continuous and line emission. The line spectrum is attributed to

- a) absorption of a neutrino
- b) emission of a neutrino
- c) emission of an alpha particle
- d) internal conversion

78. Raman shift in a molecule depends on the
- a) wavelength of light used
 - b) nature of the molecule
 - c) intensity of light used
 - d) frequency of light used

79. The wave function e^{ikx} represents a particle moving under the action of
- a) no forces
 - b) Coulomb force
 - c) Lorentz force
 - d) Central field

80. $\langle m|x|n\rangle$ in a harmonic oscillator exists
- a) for all values of m and n
 - b) only when $m = n$
 - c) only when $m \neq n$
 - d) only when $m = n \pm 1$

81. Which one of the following about a Schrodinger wave function is not true?
- a) it should be integrable throughout the space.
 - b) it should be zero at the extrema
 - c) it should be capable of providing every measurable parameter
 - d) it has no physical meaning.

82. Which one of the following cannot be called as a conjugate pair?
- a) p, r
 - b) E, t
 - c) p_x, x
 - d) p_z, y

83. The ground state of hydrogen does not exhibit any Stark effect because,
- a) hydrogen is not affected by an applied electric field
 - b) its principal quantum number is 1
 - c) there is no electric field associated with it
 - d) the parity of its wave function is even

84. Identify the wrong entry
- a) $[x, p_x] = i$
 - b) $[y, p_y] = i$
 - c) $[L_x, L_y] = iL_z$
 - d) $[L_y, L_x] = iL_z$

85. The trial function for variational method in case of seeking solution to the He atom problem would be that of
- a) a free particle
 - b) a particle moving inside a potential well
 - c) a proton
 - d) a hydrogen atom

94. When light travels from a medium of high refractive index to one of low refractive index, at and beyond the critical angle, the transmitted wave
- a) disappears
 - b) travels along the interface
 - c) gets reflected
 - d) travels normal to the interface
95. A ray of light is normally incident at the interface between air and glass. If 4% of the light is reflected, the refractive index of the glass is
- a) 1.33
 - b) 1.4
 - c) 1.5
 - d) 1.7
96. Maxwell equation on the curl of E is a restatement of
- a) Amperes law
 - b) Faradays law
 - c) Gauss law
 - d) Biot-Savart law
97. A Hall voltage introduced in a semiconductor when
- a) a current flows through it
 - b) when it is subjected to a magnetic field
 - c) when it is subjected to magnetic field and a current is flowing through it
 - d) when it is subjected to an electric field and a current flows through it
98. Skin depth is a term associated with the propagation of electromagnetic waves in
- a) an insulator
 - b) an ionized gas
 - c) a liquid
 - d) a good conductor
99. The potential due to an arbitrary distribution charges at a point away from the distribution is given by
- a) the dipolar contribution alone
 - b) the quadrupole contribution alone
 - c) a set of multipoles
 - d) by the average charge of the distribution
100. Light from Sun takes 8 minutes to reach earth's surface. This means that the image of the Sun that we at this moment is that of the
- a) Sun that exists at this moment
 - b) Sun that would exist later
 - c) Sun that existed sometime earlier in time
 - d) Sun that existed some 4 minutes ago

Question no.	Answer	Question no.	Answer
51	a	76	c
52	c	77	d
53	d	78	b
54	c	79	a
55	a	80	d
56	b	81	d
57	d	82	d
58	b	83	d
59	b	84	d
60	b	85	d
61	c	86	d
62	c	87	a
63	a	88	c
64	c	89	d
65	b	90	b
66	c	91	a
67	b	92	c
68	d	93	c
69	c	94	b
70	a	95	c
71	a	96	b
72	d	97	c
73	a	98	d
74	b	99	c
75	c	100	c