NITESHPHYZICS

Nitesh Phyzics

CUET 2019

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An Institute of
NET-JRF, IIT-JAM, GATE, JEST, TIFR
CUET Entrance in Physics
Physical Sciences
New Delhi

CUET – 2019 (Physics)

PART-A

1. Madness : Brain : : Paralysis :__ ?

(A) Arm (B) Face (C) Body (D) Nerves

2. " A Thing of Beauty is a Joy Forever" is a poem by ?

(A) William Shakespeare (B) J.K. Rowling

(C) John Keats (D) George Eliot

3. Reena is twice as old as Meeta was two years ago. If difference between their age be 2 years, how old Reena today ?

(A) 6 Years (B) 8 Years (C) 10 years (D) 12 Years

4. In an examination, 42 % students failed in Hindi and 52 % failed in English. If 17 % failed in both the subjects, the percentage of those who passed in both the subjects is:

(A) 23 % (B) 27 % (C) 34% (D) 40%

5. 10 women can complete a work in 7 days and 10 children take 14 days to complete the work. How many days will 5 women and 10 children take the complete the work?

(A) 3 (B) 5 (C) 7 (D) 9

6. Which apparatus is used to measure the purity of milk?

(A) Luxometer (B) Calorimeter (C) Anemometer (D) Lactometer

7. When is Hindi Diwas observed?

(A) 14th September (B) 14th Feburary

(C) 14th June (D) 14th December

8. Choose the most appropriate word from the options given below to complete the following sentence.

Communication and interpersonal skill are _____important in their own ways.

(A) Each (B) Both (C) All (D) Either

9. Which of the option given below best complete the following sentence?

She will fell much better if she____

(A) Will get some rest (B) Get some rest

(C) Will be getting some rest (D) Is getting some rest

10. In many part of Japan, most houses are built with____ wood.

(A) No article (B) a (C) an (D) the

11. In our country agriculture must__pace with Industrial development.

(A) Take (B) Make (C) Loose (D) Keep

12. Select the most suitable synonym for the word 'ABDUCT'.

(A) Ransack (B) Surround (C) Destroy (D) Kidnap

13. Select the suitable synonym for the word 'ABSCOND'

(A) Run away (B) Give away (C) Move away (D) Forbid

14. Select the suitable Antonym for the word 'PASSIVE'

(A) Assertive (B) Bright (C) Chirpy (D) Higher

15 Select the suitable Antonym for the word 'BATTERY'

(A) Slimy (B) Individual (C) Dense (D) Clean

16. Select the pair which shows the same relationship as COMPUTER : RAM

(A) Book : Page (B) Cloud : Rain (C) Table : Tabletooth (D) Sky : Blue

17. Choose the appropriate set of words that makes the sentence most meaningful:

The _____successfully repelled every_____ on the city.

(A) Defends, comment (B) Citizens, onslaught

(C) Thieves, robbery (D) Judge, criticism

18. The speed of three motor bike are in the ratio 6 : 5 : 4. The raio between the time taken by them to travel the same distance is:

(A) 10 : 12 : 15 (B) 12 : 10 : 8 (C) 15 : 12 : 10 (D) 10 : 15 : 12

19. Introducing Asha to guests, Bhaskar said, " Her father is the only son of my father." How is Asha related to Bhashkar?

(A) Daughter (B) Mother (C) Niece (D) Sister

20. The series 5, 10, 20, 40, ... What will be 10^{th} term?

(A) 1280 (B) 2560 (C) 1820 (D) 2650

21. If the digit 12 of a clock is pointing towards East, then in which direction will digit 9 point?

(A) South (B) West (C) North (D) North East

22. Which of the number given below is not the square nuber ?

(A) 1225 (B) 2025 (C) 2225 (D) 4225

23. In a simultaneous throw of two dice, what us the probability of getting a total 10 or 11 ?

(A) 1/12 (B) 5/36 (C) 1/9 (D) 1/18

24. Select the odd one out

(A) RAM (B) Flash Memory (C) Hard Disk (D) Floppy

25. Which is the largest organ in human beings ?

(A) Large Intestine (B) Skin (C) Small Intestine (D) Live

PART-B

26. The common mode rejection ratio (C MR R) of a differential amplifier using an operational amplifier is 100 dB. The output voltage for a differential input of 200μV is 2 V. The common mode gnin is

(A) 10 dB (B) 0.1 dB (C) 30 dB (D) 10 dB

27. If the wavelength of the first line of time Balmer series in the hydrogen spectrum is λ. Then the wavelength of the first line of the Lyman series is

(A) (27/5) λ (B) (5/27) λ (C) (32/27) λ (D) (27/32) λ

28. The electric field of a light wave is given by $E = E_o\left[i \sin(\omega t - kz) + j \sin\left(\omega t - kz - \frac{\pi}{2}\right)\right]$ The polarization state of the wave is

(A) Left handed circular (B) Right handed circular

(C) Left handed elliptical (D) Right handed elliptical

29. A collimated beam of light of diameter 1 mm is propagating along the x-axis. The beam is to be expanded to a collimated beam of diameter 10 mm using a combination of two convex lenses. A lens of focal length of 50 mm and another lens with focal length F are to be kept at a distance d between them, The value of F and d respectively are

(A) 450 mm and 10 mm (B) 450 mm and 500 mm

(C) 550 mm and 600 mm (D) 500 mm and 550 mm

30. A left circularly polarized beam (λ_o =5893 Å) is incident normally on a calcite crystal (with its optic axis cut parallel to the surface) of thickness 0.005141 mm. The state of polarization of the emergent beam will be

(A) Left handed circular (B) Right handed circular

(C) Left handed elliptical (D) Right handed elliptical

31. A quartz plate is a half wave plate for the light whose wavelength is λ. Neglecting the variations in the indices of refraction with wavelength how would this behave with the light of wavelength 2λ

(A) Quarter waveplate

(B) Half waveplate

(C) Will not change the state of polarization

(D) Will introduce an arbitrary change in polarization state

32. Two wavelengths λ_1 = 5890 Å and I -5896 are λ_2 = 5896 Å emitted by a source of light. Interference fringes are observed with certain arrangement when the paths of the interfering beams arc exactly equal. The increase in the path difference when bright fringe for λ_2; coincides with the dark fringe of λ_1:

(A) 0.0289 cm (B) 0.289 cm (C) 2.89 cm (D) 0.0145 cm

33. How many order will be visible if the wavelength of incident light is 5000 Å and the number of lines on the grating be 2620 to an inch:

(A) 30 (B) 25 (C) 19 (D) 29

34. The number of atoms present in the unit cell of hcp structure are

(A) 2 (B) 4 (C) 6 (D) 12

35. What is the second nearest neighbor distance in a FCC lattice whose conventional unit cell parameter is a is

(A) $\frac{a}{\sqrt{2}}$ (B) $\frac{a}{2}$ (C) a (D) $\frac{\sqrt{2}}{a}$

36. (3, 2, 6) are the Miller indices of a plane, the intercept made by the plane on the three crystallographic axis are

(A) (2a, 3b, c) (B) (a, b, c) (C) (a, 2b, 3c) (D) (3a, 2b, c)

37. A lattice is characterized by $\vec{a} = 2\,(\hat{i} + \hat{j})$, $\vec{b} = 2\,(\hat{j} + \hat{k})$, $\vec{c} = 2\,(\hat{k} + \hat{i})$. The reciprocal lattice corresponding to this is

(A) BCC with cube edge π (B) BCC with cube edge 2π

(C) FCC with cube edge π (D) BCC with cube edge 2π

38. If the angle between the direction of the incident X-ray and diffracted one is 16°, the glancing angle will be-

(A) 32° (B) 24° (C) 90° (D) 82°

39. The temperature dependence of the electrical resistivity of a metal according to the classical free electron theory is

(A) $\rho \propto T^2$ (B) $\rho \propto T^{-1}$ (C) $\rho \propto T^{1/2}$ (D) $\rho \propto T^{-2}$

40. The order of magnitude of the binding energy per nucleon is

(A) 10^{-5} MeV (B) 10 MeV (C) 10^{-3} MeV (D) 100 MeV

41. An ideal gas is compressed to half its volume by a reversible process. Let W_1 be the energy transacted by the work if the process is isothermal. Let W_2 be the energy transacted by work if process is adiabatic. Then

(A) $W_1 > W_2$ (B) $W_1 < W_2$

(C) $W_1 = W_2$ (D) $W_1 = W_2^{\gamma}$, where $\gamma = 5/3$

42. For β^+ decay the difference between the mass of parent and daughter nucleus should be

(A) Equal to mass of the electron

(B) Greater than mass of the electron

(C) Equal to the twice of mass of the electron

(D) Greater than the twice of mass of the electron

43. A particle vibrates with SHM of amplitude 5 cm and a period of 6 seconds. How long does it take to move from one end of its path to a position of 2.5 cm from the equilibrium position on the same side?

(A) 0.5 s (B) 1 s (C) 1.5 s (D) 0.75 s

44. Which property of the wave will not change in going from one medium to another?

(A) Frequency (B) Phase (C) Wavelength (D) Amplitude

45. Which of the following is a valid solution of the differential equation $\frac{\partial^2\psi}{\partial x^2} + \frac{\partial^2\psi}{\partial y^2} = 0$

(A) $ax^2 - by^2$ (B) $x^2 - y^2$ (C) $x^2 + y^2$ (D) $x^4 + y^4$

46. In the second excited state of a 1D harmonic oscillator with angular frequency ω, the eigen value will be

(A) $\frac{1}{2}\hbar\omega$ (B) $\frac{3}{2}\hbar\omega$ (C) $\frac{5}{2}\hbar\omega$ (D) $3\hbar\omega$

47. The eigen value of the matrix

$$A = \begin{bmatrix} cos\theta & -sin\theta \\ sin\theta & cos\theta \end{bmatrix}$$

(A) $e^{\pm i\theta}$ (B) $e^{\pm 2i\theta}$ (C) $e^{\pm 3i\theta}$ (D) $e^{\pm i\theta/2}$

48. The sum of the residues at the poles of the complex function $f(z) = \frac{z^2}{(z-)(z-2)(z-3)}$ is:

(A) 1 (B) 2 (C) 3 (D) 4

49. Speed of an electron whose de-Broglie wavelength is equal to its Compton wavelength, is (c is the speed of light)

(A) c (B) $c/\sqrt{2}$ (C) c/2 (D) c/3

50. Using Cauchy's Residue theorem the value of the integral $\oint \frac{e^z dz}{z\,(z-1)^2}$ around the contour $|Z| = 2$; will be

(A) πi (B) 4πi (C) Zero (D) 2πi

51. The value of m for which the function $2x - x^2 + xy^2$ will be harmonic is-

(A) 0 (B) 1 (C) 2 (D) 3

52. A particle of mass m, released from height h falls under gravity. Assuming that the resistance offered by the atmosphere is mkv2, where k is constant and v is the speed of the particle, the terminal speed of the particle will be-

(A) $\sqrt{\frac{g}{k}}$ (B) $\frac{g}{k}$ (C) $\sqrt{\frac{2g}{k}}$ (D) $\sqrt{gk}$

53. The integrating factor of the differential equation x2y'' + xy' – y = 0; is

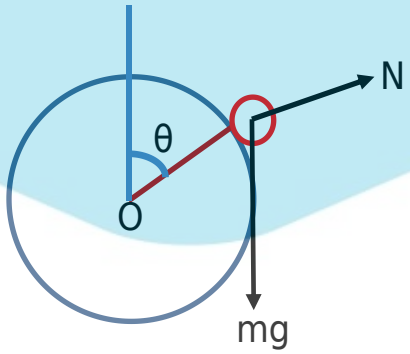
(A) x (B) x^2 (C) $3x^4$ (D) x^3

54. The solution of the differential equation $\frac{dy}{dx} = \frac{x}{y+1}$ are

(A) Straight line with intercept y axis (B) Straight line with different slopes

(C) Circle with different centers (D) Circles with different radii

55. A particle slides on the surface of a fixed sphere from the top most point as shown in figure. The angle at which the particle leaves contact with the sphere is



(A) $\sin^{-1}\frac{1}{3}$ (B) $\sin^{-1}\frac{2}{3}$ (C) $\cos^{-1}\frac{1}{3}$ (D) $\cos^{-1}\frac{2}{3}$

56. Which of the following is Hermitian matrix?

(A) $\begin{bmatrix} 0 & i \\ i & 0 \end{bmatrix}$ (B) $\begin{bmatrix} 0 & i \\ -i & 0 \end{bmatrix}$ (C) $\begin{bmatrix} i & 0 \\ 0 & i \end{bmatrix}$ (D) $\begin{bmatrix} i & 0 \\ 0 & -i \end{bmatrix}$

57. Cylinder fitted with a piston contains air at a pressure of 500 kilo pascals; the volume of air is 0.02 cubic meter. At a constant pressure, the air expands and does 40 kilo joules of work. The final volume of air in the cycle is (in terms of cubic meter)

(A) 0.05 (B) 0.01 (C) 0.10 (D) 0.15

58. The differential form of Gauss law in C.G.S. is

(A) $\vec{\nabla}\vec{E} = \frac{\rho}{\varepsilon 0}$ (B) $\vec{\nabla}\vec{E} = \frac{\sigma}{\varepsilon 0}$ (C) $\vec{\nabla}\vec{E} = 4\pi\rho$ (D) $\vec{\nabla}\vec{E} = 4\pi\sigma$

59. The electric potential due to linear quadrupole varies inversely with

(A) r (B) r^2 (C) r^3 (D) r^4

60. The point charge q, q and -2q are located at (0, -a, a), (0, a, a) and (0, 0, -a) respectively. The net dipole moment of this charge distribution is

(A) $4qa\,\hat{k}$ (B) $2qa\,\hat{k}$ (C) $-4qa\,\hat{i}$ (D) $-2qa\,\hat{j}$

61. A dielectric sphere of radius R carries polarization $\underset{P}{\rightarrow} = kr^2\hat{r}$; where r is the distance from the center and k is a constant. In the spherical polar coordinates system $\hat{r}, \hat{\theta}, \hat{\Phi}$ are the unit vectors. The bound volume charge density inside the sphere at a distance r from the centre is

(A) $-4kR$ (B) $-4kr$ (C) $-4kr^2$ (D) $-4kr^3$

62. The ratio of the intensity of the magnetic field at the centre of a very long solenoid to that at the extreme end is

(A) 2 (B) ½ (C) 4 (D) 1/4

63. A rectangular coil of cross sectional area A is placed in a uniform electric-field. The normal to the area of the coil makes an angle 90° with the electric field. The electric flux through the rectangle is

(A) $\underset{E}{\rightarrow}$ (B) $\underset{A}{\rightarrow} \cdot \underset{E}{\rightarrow}$ (C) $\frac{\vec{A} \cdot \vec{E}}{\sqrt{2}}$ (D) 0

64. An ideal gas expands isothermally and reversibly to twice its volume. The energy transferred by work is W and by heat is +Q. The change in $\triangle U$ in internal energy is

(A) $\triangle U = W$ (B) $\triangle U = Q$ (C) 0 (D) $\triangle U = Q\text{-}W$

65. The pointing vector at the surface of a long cylindrical wire of radius R, length L carrying a current I, when its ends are kept at a potential difference V is:

(A) $\frac{VI}{2\pi r^2+2\pi RL}$ (B) $\frac{VI}{\pi r^2 L}$ (C) 0 (D) $\frac{VI}{2\pi RL}$

66. A plane electromagnetic wave $E = \frac{100\cos(6\ X\ 10^8\ t + 4x)V}{m}$ propagates in a medium of dielectric constant

(A) 1.5 (B)2 (C) 2.4 (D) 4

67. Which of the following statements about $\underset{E_1}{\rightarrow} = x\,\hat{i} + y\hat{j}$ and $\underset{E_2}{\rightarrow} = xy^2\,\hat{i} + y^2\hat{j}$ is correct

(A) Both $\underset{E_1}{\rightarrow}$ and $\underset{E_2}{\rightarrow}$ represents electromagnetic wave

(B) Neither $\underset{E_1}{\rightarrow}$ nor $\underset{E_2}{\rightarrow}$ can represents electromagnetic wave

(C) Only $\underset{E_1}{\rightarrow}$ represents electromagnetic wave

(D) Only $\underset{E_2}{\rightarrow}$ represents electromagnetic wave

68. An electromagnetic wave travels along Z axis. Which of the following pair of space and time varying fields would generate such a wave

(A) *Ex, By* (B) *Ey, Bz* (C) *Ez, Bx* (D) *Ey, Bz*

69. The skin depth of the an electromagnetic wave having an electric field E = e $-\frac{z}{\delta}$ cos $(\omega t - \frac{z}{\delta})$

(A) $\frac{1}{\delta}$ (B) $\frac{2}{\delta}$ (C) δ (D) 2δ

70. The electric field of a plane electromagnetic wave E= Eo exp$\left[i\,(\hat{x}k\cos\alpha + \hat{y}k \sin(\alpha - \omega t))\right]$ and $\hat{z}$ are the Cartesian unit vectors the wave vector $\hat{k}$ of the electromagnetic wave is

(A) $\hat{z}$ k (B) $\hat{x}$k sinα + $\hat{y}$k cosα

(C) $\hat{x}$k cosα + $\hat{y}$k sinα (D) -$\hat{z}$k

71. Circular Platform of large radius is rotating about its axis with a constant angular velocity $\underset{\omega}{\rightarrow} = \omega\hat{z}$. The rotation is anti-clock wise when see from the above. You are standing at somepoint on the platform and you start moving toward the centre. Then due to Coriolis force, you will be-

(A) Pushed to your left (B) Pushed to your right

(C) Pushed radially outward (D) Pushed radially toward the centre

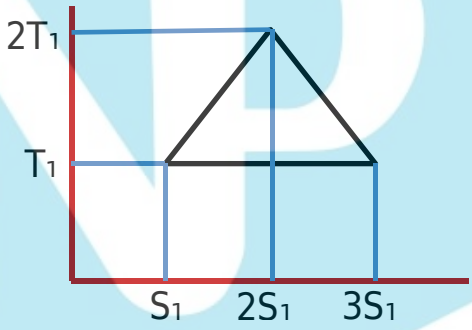
72. A Carnot engine operating between 27°C and 127°C has efficiency equal to

(A) 21% (B) 22% (C) 24 (D) 25%

73. The dimension of the phase space of ten rigid diatomic molecule is

(A) 5 (B) 10 (C) 50 (D) 100

74. A reversible engine cycle is shown in the following T-S diagram. The efficiency of the engine is



(A) $\frac{1}{2}$ (B) $\frac{1}{4}$ (C) $\frac{1}{3}$ (D) $\frac{1}{5}$

75. In grand canonical ensemble, the comprising system are capable of exchanging

(A) Only E (B) Only N (C) Both E & N (D) Neither E nor N

76. Under the equilibrium condition the thermodynamic variable associated with black body radiation at temperature T which reduces to zero is

(A) Entropy (B) Helmholtz free energy

(C) Gibb's free energy (D) Pressure

77. The free energy of a photon gas enclosed in a volume V is given by = - $\frac{1}{3}\alpha VT^4$, where α is a constant and T is the temperature of the gas. The chemical potential of the photon gas is

(A) $\frac{4}{3}\alpha VT^2$ (B) $\frac{1}{3}\alpha VT^4$ (C) αVT^4 (D) 0

78. A body of mass m_0 is placed in a rocket. The rocket is moving with a velocity v = 0.6 c. The mass of the body observed by a person sitting in the rocket is

(A) m_0 (B) $\frac{5}{4}m_0$ (C) $\frac{4}{5}m_0$ (D) $2m_0$

79. The Lorentz transformation are equivalent to rotation of axes in four dimensional space through an imaginary angle

(A) tan (iβ) (B) Sin $(\frac{i\beta}{\sqrt{1-\beta^2}})$ (C) $\tan^{-1}$ (iβ) (D) Cos^{-1} $(\frac{i\beta}{\sqrt{1-\beta^2}})$

80. If the momentum of an electron moving with a velocity 0.9c is increased by 1% than the increase in its energy is

(A) 1% (B) 0.9% (C) 0.81% (D) 0.5%

81. The homogeneity of time leads to the conversion of

(A) Linear momentum (B) Angular momentum

(C) Energy (D) Parity

82. A particle has rest mass m_o and momentum m_oc where c is the velocity of light. The total energy and velocity of the particle are respectively

(A) $\sqrt{2}\ m_oc^2$ and $\frac{c}{2}$ (B) $2\ m_oc^2$ and $\frac{c}{\sqrt{2}}$

(C) $\sqrt{2}\ m_oc^2$ and $\frac{c}{\sqrt{2}}$ (D) $2\ m_oc^2$ and $\frac{c}{2}$

83. The wave function for a particle moving in x-direction $\psi(x) = A\ e^{ikx}$, $0 < x < L$, the value of the normalization constant A is:

(A) $\frac{2}{\sqrt{L}}$ (B) $\frac{21}{\sqrt{L}}$ (C) $L^{3/2}$ (D) $\frac{1}{L^{3/2}}$

84. For the wave function $\psi\ (x) =\ N \exp\ (-\frac{x^2}{2a^2} + ikx\ )$, the expectation value of the momentum is

(A) $\hbar\ k$ (B) $\frac{\hbar}{2a}$ (C) $\frac{ka}{a}$ (D) $\frac{\hbar\ k}{4}$

85. A particle describe by a wave function $\psi\ (x) =\ e^{-|\,x\,|}$ in one dimension. The probability that it will be found in the region $|\,x\,| \leq a$ is

(A) e^{-a} (B) e^{-2a} (C) $1 -\ e^{a}$ (D) $1\text{-}e^{-2a}$

86. For a free particle, the uncertainty relation can be written as

(A) $\triangle\lambda \cdot \triangle x \geq \frac{\lambda^2}{\pi}$ (B) $\triangle\lambda \cdot \triangle x \geq \frac{\lambda^2}{2\pi}$

(C) $\triangle\lambda \cdot \triangle x \geq \frac{\lambda^2}{4\pi}$ (D) $\triangle\lambda \cdot \triangle x \geq \frac{\lambda^2}{8\pi}$

87. Which one of the following is a correct set of magic numbers?

(A) 1, 2, 8, 16, 20, 28 (B) 2, 8, 16, 20, 28, 50

(C) 8, 28, 50, 82, 100, 126 (D) 2, 8, 20, 28, 50, 82, 126

88. The half life of ^{214}Bi is 20 mins. What fraction of a sample of ^{214}B will remain after 2 hours

(A) 1/6 (B) 1/20 (C) 1/36 (D) 1/64

89. For a radioactive nucleus, the mean life is T. If the number of decays per unit time is n at t = 0, the number of decays between time t = 0 and t is

(A) $nTe^{-t/T}$ (B) $n(1- e^{-t/T})$ (C) $nT(1- e^{-t/T})$ (D) $ne^{-t/T}$

90. A nucleus having mass number 240 decays by α-emission to the ground state of its daughter nucleus. The Q value of the process is 5.26 MeV. The energy (in MeV) of the α-particle is

(A) 5.26 (B) 5.17 (C) 5.13 (D) 5.09

91. The angular momentum and parity of the ${}^{17}_{8}O$ nucleus, according to the shell model of the nucleus is

(A) 0^+ (B) $\frac{1^-}{2}$ (C) $\frac{3^+}{2}$ (D) $\frac{2^+}{2}$

92. If the ratio of the concentration of electrons to that of the holes in a semiconductor is 7/5 and the ratio of the current is 7/4, then what is the ratio of their drift velocities?

(A) 4/7 (B) 5/8 (C) 4/5 (D) 5/4

93. If a semiconductor has an intrinsic carrier concentration of $1.41 \text{ X } 10^{16}/m^3$ when doped with 10^{21} $/m^3$ phosphorus atoms, then the concentration of holes/m^3 at room temperature will be

(A) $2 \text{ X } 10^{21}$ (B) $2 \text{ X } 10^{11}$ (C) $1.41 \text{ X } 10^{21}$ (D) $1.41 \text{ X } 10^{16}$

94. An electron oscillator gives sustained oscillations when feedback is

(A) Negative and out of phase with input

(B) Negative and in phase with input

(C) Positive and out of phase with input

(D) Positive and in phase with input

95. If the peak output voltage of a full wave rectifier is 10 V, its DC voltage is

(A) 10 V (B) 7.07 V (C) 6.36 V (D) 3.18 V

96. When a transistor amplifier having current gain of 75 is given input signal V (t) = 2 sin $(157t + \frac{3\pi}{2})$; the transistor is connected as

(A) A common collector amplifier (B) A common base amplifier

(C) A common emitter amplifier (D) An oscillator

97. The Fermi level of an intrinsic semiconductor is pinned at the centre of the band-gap. The probability of occupation of the highest electron state in valence band at room temperature, will be

(A) 0 (B) Between 0 and 1/2 (C) 1/2 (D) 1

98. The Boolean expression $\overline{\overline{A}B} + \overline{A} + AB$ is equivalent to

(A) A (B) $\overline{A}$ (C) 1 (D) Zero

99. If the ouput of a logic gate is 0 when all the inputs are at logic 1, then the gate is either

(A) NAND or Ex-NOR (B) NOR or OR

(C) Ex-OR or NOR (D) AND or NOR

100. In order to obtain a solution of the differential equation $\frac{d^2V}{dt^2}$ - 2 $\frac{dV}{dt}$ + V_1 = 0, involving voltage V(t) and V1, an operational amplifier V (t) and V1, an operational amplifier circuit would require at least

(A) Two op-amp integrators and one op-amp adder

(B) Two op-amp differentiators and one op-amp adder

(C) One op-amp integrator and one op-amp adder

(D) One op-amp integrator, one op-amp differentiator and one-amp adder

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