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Set B

Clamphook CBT

2080

Full Marks: 140 **Time:** 2 hours **Pass Marks:** 56

1. If $\mathrm{f}(\mathrm{x}) = \frac{x - |x|}{|x|}$, then value of $\mathrm{f}(-1)$ is

a. 0 b. 1

c. -2 d. 2

2. The set of all prime numbers is

a. a finite set b. a null set

c. a singleton set d. an infinite set

3. A is a matrix of 2×3. Both $A^T B$ and AB^T are defined then the order of B is:

a. 2×3 b. 3×2

c. 2×2 d. 3×3

4. Argument of complex number $z = \pi$ is

a. 0 b. π

c. $\frac{\pi}{2}$ d. $-\frac{\pi}{2}$

5. Binomial expansion of $\frac{1}{\sqrt{5 - 4x}}$ valid for

a. $x < \frac{5}{4}$ b. $|x| \leq \frac{5}{4}$

c. $|x| \geq \frac{5}{4}$ d. $|x| \leq \frac{4}{5}$

6. The first term of an infinite G.P. is x and its sum is 5. Then,

a. $-10 < x < 0$ b. $0 < x < 10$

c. $-10 \leq x \leq 0$ d. $0 \leq x \leq 10$

7. The period of function $f(x) = |\sin x| + |\cos x|$ is

a. $\frac{\pi}{6}$ b. $\frac{\pi}{4}$

c. $\frac{\pi}{2}$ d. π

8. $\sin\left(\sin^{-1}\frac{1}{5} + \cos^{-1} x\right) = 1$ then value of x is

a. $\frac{1}{4}$ b. $-\frac{1}{4}$

c. $\frac{1}{5}$ d. $-\frac{1}{5}$

9. If $\cos 3\theta - \cos\theta = 0$, then general solution of $\theta =$

a. $n\pi$ b. $\frac{n\pi}{4}$

c. $2n\pi$ d. $\frac{n\pi}{2}$

10. The area of the triangle with the vertices (a,b+c), (b,c+a),(c,a+b) is given by

a. abc b. 2abc

c. $\frac{1}{2}$ abc d. 0

11. The number of tangents from (1,2) to circle $x^2 + y^2 - 2x - 4y + 4 = 0$ is/are

a. 0 b. 1

c. 2 d. 3

12. The ratio in which line joining the points (2,1,3) and (4,−2,5) is divided by the plane 2x+y-z=3 is

a. 1:1 externally b. 1:2 externally

c. 2:3 internally d. 4:5 internally

13. The equation of the plane which cuts equal intercepts of length unity on the axes is:

a. $x + y + z = 0$ b. $x + y + z = 1$

c. $x + y - z = 1$ d. $x + y + z = -a$

14. The locus of the center of a circle which touches externally the given two circles is

a. ellipse b. parabola

c. hyperbola d. circle

15. $\vec{i}.(\vec{j} \times \vec{k}) + \vec{j}.(\vec{k} \times \vec{i}) + \vec{k}.(\vec{i} \times \vec{j})$

a. 0 b. 1

c. 2 d. 3

16. $\lim_{x \to \frac{\pi}{4}} \frac{\tan x - 1}{x - \frac{\pi}{4}}$

a. 1 b. 1/2

c. 2 d. 4

17. $\frac{d}{dx}(\cos^{-1} x + \sin^{-1} x) =$

a. 0 b. 1

c. π d. $\frac{\pi}{2}$

18. Point of inflection of the function $f(x) = x + \frac{100}{x} + 5$ is at x=

a. 10 b. -10

c. 200 d. doesnt exist

19. The area of the rectangle bounded by $|\ x\ | = 2$, the x-axis and y=1 is:

a. 1 b. 2

c. 3 d. 4

20. The area bounded by the curve $y^2 = 8x$ and $x^2 = 8y$ is

a. $\frac{16}{3}$ b. $\frac{64}{3}$

c. $\frac{64}{7}$ d. $\frac{64}{5}$

21. Which of the following is a dimensional constant?

a. relative density b. gravitational constant

c. refractive index d. poisson ratio

22. The ratio of displacement to distance is

a. always less than one b. always greater than one

c. equals to or more than one d. equals to or less than one

23. The coefficient of restitution e for a perfectly elastic collision is

a. 1 b. 0

c. -1 d. ∞

24. If the change in the value of g at a height x (<< R) above the surface of the Earth is same as at a depth y (<< R) below it, then

a. y = 2x b. x = 2y

c. x= 3y d. x= 9 y

25. If a spring of force constant K is cut into 3 equal parts, then force constant of each part is,

a. K b. 3K

c. K/3 d. K/9

26. Oil kept in a frying pan spreads more easily when it is hot. It is due to

a. density b. surface tension

c. viscosity d. angle of contact

27. 50 g of benzene weighs

a. More in summer than in winter b. Equal in summer and in winter

c. Less in summer than in winter d. More or less according to purity

28. The efficiency of all reversible heat engines working between same hot and cold reservoirs

a. is same. b. depends on fuel used.

c. depends on pressure. d. depends on volume

29. The rear view in a car is

a. plane mirror b. concave mirror

c. convex mirror d. planoconvex mirror

30. An unpolarized beam of intensity I_0 falls on a polaroid. The intensity of emergent light is

a. I_0 b. $I_0/2$

c. $I_0/4$ d. $2I_0$

31. Through which character we can distinguish the light waves from sound waves

a. interference b. refraction

c. polarization d. reflection

32. A capacitor works in

a. AC circuit
b. DC circuit
c. Both
d. None

33. The thermal velocity of free electrons in a conductor is of the order of

a. 1 m/s
b. 10 m/s
c. 10^3 m/s
d. 10^5 m/s

34. The time period of a charged particle undergoing a circular motion in a uniform magnetic field is independent of its

a. speed
b. momentum
c. charge
d. magnetic field

35. In photoelectric effect, the number of photoelectrons emitted is proportional to

a. Intensity of incident beam
b. Frequency of incident beam
c. Velocity of incident beam
d. Work function of photo-cathode

36. In a radioactive decay neither the atomic number nor the mass number changes which of the following would be emitted in the decay process :

a. proton
b. electron
c. neutron
d. photon

37. Insulator has ___ temperature coefficient of resistance

a. negative
b. positive
c. zero
d. may be positive or negative

38. Which of the following has the largest size?

a. Cl^{++}
b. Cl^{+}
c. Cl
d. Cl^{-}

39. If the equivalent weight of a trivalent metal is 32.7, the molecular weight of its chloride is

a. 68.2
b. 103.7
c. 204.6
d. 32.7

40. The compound which contains both ionic and covalent bonds is

a. CH_4
b. H_2
c. KCN
d. KCl

41. Standard electrode potential of three metals X, Y and Z are – 1.2 V, + 0.5 V and – 3.0 V, respectively. The reducing power of these metals will be

a. Y > Z > X
b. X>Y > Z
c. Z > X > Y
d. X > Z > Y

42. The oxidation state of phosphorous varies from

a. -1 to +1
b. -3 to +3
c. -3 to +5
d. -5 to +1

43. Principal, azimuthal and magnetic quantum no respectively represent

a. size, shape and orientation
b. shape, size and orientation
c. size, orientation and shape
d. size, orientation, orientation

44. When Zn reacts with cold and dilute HNO_3 to produce

a. NO
b. NO_2
c. NH_4NO_3
d. $H2$

45. Maximum covalency of fluorine is

a. 2
b. 1
c. 3
d. 4

46. The process of coating zinc by heating iron article with zinc dust is

a. annealing
b. tempering
c. galvanizing
d. sheradising

47. Benzene can be converted into toluene by

a. Kolbe's reaction
b. Friedel-Crafts reaction
c. Reimer-Tiemann reaction
d. Sabiatier and Sendren's reaction

48. The total structural isomers of C_4H_{10} are

a. 5
b. 7
c. 2
d. 4

49. The principal and coordinator _____ students.

a. teach
b. teaches
c. is taught
d. are taught

50. The police asked "did you commit crime?"

a. The police asked me, if I had committed crime.
b. The police asked me if had I committed crime.
c. The police asked me if I committed crime.
d. The police asked me that I had committed crime.

51. Which of the following is a complex Sentence?

a. Both of them are happy.
b. She can't stay here, for she doesn't feel safe.
c. As Kailash is late, he can't receive anybody's phone.
d. Either he or his brother will attend the party.

52. I'm waiting for you in the garden.

a. S+ V+ subject complement
b. S+ V+ O
c. S+ V+ A
d. S+ V+ OI + OD

53. None so blind as _____ that will not see. [

a. them
b. they
c. him
d. her

54. If I were a teacher, I ___mobile phone

a. would allow
b. allow
c. will allow
d. had allowed

55. Which of the following is incorrect?

a. She made him to go.
b. He was made to sing.
c. He let her go.
d. He bade me take that out.

56. There is nothing to read.

a. There is nothing to be read.
b. Nothing is to be read.
c. There is nothing read.
d. Nothing is read there.

57. I am amazed _____ gift.

a. at
b. in
c. for
d. to

58. A fixed orbit in space in relation to earth [ ]

a. Geological
b. Geo-synchronous
c. Geocentric
d. Geo-stationary

59. The word 'unco-operative' has its stress on the ___ syllable.

a. 1st
b. 2nd
c. 3rd
d. 4th

60. Find out the phonemic transcription of 'potato'.

a. /pɔːtætəʊ/
b. /pəteltəʊ/
c. /pɔːtætɔː/
d. /pətetəʊ/

Read the following passage carefully, and find out the correct answers for the questions given below:
(Questions from 61 to 64)

Both plants and animals of many sorts show remarkable changes in form, structure, growth habits, and even mode of reproduction in becoming adapted to different climatic environment, types of food supply, or mode of living. This divergence in response to evolution is commonly expressed by altering the form and function of some part or parts of the organism, the original identity of which is clearly discernible. For example, the creeping foot of the snail is seen in related marine pteropods to be modified into a flapping organ useful for swimming, and is changed into prehensile arms that bear sectorial disks in the squids and other cephalopods. The limbs of various mammals are modified according to several different modes of life—for swift running (crusorial) as in the horse and antelope, for swinging in trees (arboreal) as in the monkeys, for digging (fossorial) as in the moles and gophers, for flying (volant) as in the bats, for swimming (aquatic) as in the seals, whales and dolphins, and for other adaptations. The structures or organs that show main change in connection with this adaptive divergence are commonly identified readily as homologous in spite of great alterations. Thus, the finger and wrist-bones of a bat and whale, for instance, have virtually nothing in common except that they are definitely equivalent elements of the mammalian limb.

61. The author provides information that would answer which of the following questions?
I. What factors cause change in organism?
II. What is the theory of evolution?
III. How are horses' legs related to seals' flipper?

a. Only I
b. nly II

c. Both I and II
d. I, II and III

62. Which is the most appropriate title for the passage, based on its content?

a. Evolution
b. Our Changing Bodies
c. Adaptive Divergence
d. Change in Organs

63. The author organizes the passage by

a. comparison and contrast
b. general statements followed by examples
c. hypothesis and proof
d. definition of key terms

64. The author's style can best be described as

a. Objective
b. Humorous
c. Esoteric
d. Patronizing

65. You have 2.5 N and 0.625 N solutions. In which proportion would you mix these solutions to get 1 N of 1 litre solution?

a. 200 ml & 800 ml
b. 500 and 500 ml
c. 800 ml & 200 ml
d. 600 ml & 400 ml

66. Which one of the following pairs of gases contains the same number of molecules [ ]

a. 16 g of O2 and 14 g of N2
b. 8 g of O2 and 22 g of CO2
c. 28 g of N2 and 22 g of CO2
d. 32 g of O2 and 32 g of N2

67. Consider the following relations for emf of a electrochemical cell:

(i) emf of cell = (Oxidation potential of anode) – (Reduction potential of cathode)

(ii) emf of cell = (Oxidation potential of anode) + (Reduction potential of cathode)

(iii) emf of cell = (Reduction potential of anode)+ (Reduction potential of cathode)

(iv) emf of cell = (Oxidation potential of anode) – (Oxidation potential of cathode)

Which of the above relations are correct?

a. (ii) and (iv)
b. (iii) and (i)
c. (i) and (ii)
d. (iii) and (iv)

68. If pH of a saturated solution of $\mathrm{Ba(OH)_2}$ is 12. the value of its K_{sp} is :

a. 4×10^{-6}
b. 4×10^{-7}
c. 5×10^{-6}
d. 5×10^{-7}

69. A red flower and a paper dipped in printer's ink is placed in a test tube then $\mathrm{Cl_2}$ gas is passed then

a. The paper is bleached
b. Flower is bleached and paper is not
c. None are bleached
d. Both are bleached

70. Steel contains

a. Fe + C + Mn
b. Fe + C + Al
c. Fe + Mn
d. Fe + Mn + Cr

71. $\mathrm{C_2H_5Cl + KCN \rightarrow X \xrightarrow{hydrolysis} Y.}$

Compound X and Y are

a. C_2H_5CN, $C_2H_5CH_2NH_2$ b. C_2H_5CN, C_2H_5COOH

c. C_2H_6, C_2H_5CN d. C_2H_5CN, C_2H_6

72. **The range of the function $y = \frac{x}{1+x^2}$ is:**

a. $R - \left[-\frac{1}{2}, \frac{1}{2}\right]$ b. $R - \left\{-\frac{1}{2}, \frac{1}{2}\right\}$

c. $\left[-\frac{1}{2}, \frac{1}{2}\right]$ d. R

73. **A 3x3 matrix given by, $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 1 \\ 2 & 1 & x \end{bmatrix}$ is a singular matrix if the value of x is:**

a. 1 b. -1

c. 2 d. -2

74. **The amplitude of $\frac{(\cos\theta + i\sin\theta)^4}{(\cos\theta - i\sin\theta)^5}$ is**

a. -9θ b. 9θ

c. -7θ d. 7θ

75. **If $(1+x)^n = C_0 + C_1x + C_2x^2 + C_3x^3 + ... + C_nx^n$, then $C_1 + 2C_2 + 3C_3 + ... + nC_n$ is:**

a. $n2^n - 1$ b. n^2

c. $n2^{n-1}$ d. $n(2^n - 1)$

76. **The expression $\sin\pi\frac{(x^2+y^2)}{2xy} = 0$ is true for**

a. $x = -y$ b. $x = y$

c. $x > y$ d. $x < y$

77. **The maximum and minimum values of $6\cos 8\theta$ are**

a. 1,-1 b. 6,-6

c. 8,-8 d. 1,0

78. **If $\vec{a} = \vec{i} - 2\vec{j} + \vec{k}$, $\vec{b} = p\vec{i} - 5\vec{j} + 3\vec{k}$, $\vec{c} = 5\vec{i} - 9\vec{j} + 4\vec{k}$ are coplanar then $p =$**

a. 2 b. -2

c. 3 d. -3

79. **If $a^{1/x} = b^{1/y} = c^{1/z}$ and a, b and c are in GP then x, y and z are in:**

a. AP b. HP

c. GP d. AGP

80. **The value of $f(0)$ so that the function $f(x) = \frac{2x - \sin^{-1}x}{2x + \tan^{-1}x}$ is continuous at $x = 0$ is**

a. 1 b. 2

c. 1/3 d. 2/3

81. **If $y = \sqrt{x - \sqrt{x - \sqrt{x - ...\infty}}}$, then $\frac{dy}{dx}$ is equal to**

a. $\frac{1}{2y+1}$ b. $\frac{x}{2y-1}$

c. $\frac{x}{2y-1}$ d. $\frac{x}{2y+1}$

82. If by dropping a stone in a quiet lake a wave moves in circle at speed of 3.5cm/sec , then the rate of increase of the enclosed circular region when the radius of the circular wave is 10cm , is

a. 350 sq. cm/sec , b. 35 sq. cm/sec

c. 220 sq. cm/sec d. 10 sq. cm/sec

83. $\int \left(\frac{2+\sin 2x}{1+\cos 2x}\right) e^x dx =$ **[ ]**

a. $e^x \sin x + c$ b. $e^x \tan x + c$

c. $e^x \csc x + c$ d. $e^x \sec x + c$

84. If the equation $6x^2 + 11xy - 10y^2 + x + 31y + k = 0$ represent a pair of lines then the value of K is :

a. -3 b. -5

c. -15 d. 15

85. If the line $lx + my = 1$ touches the circle $x^2 + y^2 = a^2$ then the locus of (m,n) is

a. $x^2 + y^2 = l^2$ b. $x^2 + y^2 = m^2$

c. $x^2 + y^2 = 2a^2$ d. $x^2 + y^2 = \frac{1}{a^2}$

86. The distance between the planes $2x - y + 2z + 1 = 0$ and $4x - 2y + 4z + 11 = 0$ is

a. $\frac{9}{2}$ b. 3

c. $\frac{7}{2}$ d. $\frac{3}{2}$

87. A body is projected from 20 m top tower horizontally such that it strikes the ground 40 away from foot of tower . The velocity of body striking on the ground is

a. 20 m/s b. 40 m/s

c. $20\sqrt{2}$ m/s d. $40\sqrt{2}$ m/s

88. Two hail stones with radii in the ratio of 1 : 2 fall from a great height through the atmosphere. Then the ratio of their momentum after they have attained terminal velocity is

a. 1:2 b. 1:4

c. 1:8 d. 1:32

89. A rubber ball is taken to 100 m deep lake of volume of it decreases by 0.1% the bulk modulus of rubber is.

a. $1 \times 10^9 N/m^2$ b. $2 \times 10^9 N/m^2$

c. $1 \times 10^{10} N/m^2$ d. $2 \times 10^{10} N/m^2$

90. The coefficient if real expansion of a liquid is $7 \times 10^4 C^{-1}$. The coefficient of linear expansion of the vessel is $1 \times 10^5 C^{-1}$. The coefficient of apparent expansion is

a. $7 \times 10^{-4} C^{-1}$ b. $6 \times 10^{-5} C^{-1}$

c. $67 \times 10^{-5} C^{-1}$ d. $73 \times 10^{-4} C^{-1}$

91. An object is placed 12 cm from a convex lens of focal length 8 cm. the position and nature of the image will be

a. 7.5 cm, real
b. 7.5 cm, virtual
c. 24 cm, real
d. 24 cm, virtual

92. A particle is balanced under two plates by 240 V . If radius of particles is increased by 20% what must be the volt supplied to plates to make this particles stationary ?

a. 240 V
b. 314.7 V
c. 380.8 V
d. 414.7 V

93. The resistance of wire at 20^oC is 20ohm and at 500^oC is 60 ohm. At what temperature, resistance will be 25ohm?

a. 50^oC
b. 60^oC
c. 70^oC
d. 80^oC

94. In YDS experiment, the fringe width if found to be 0.4 mm. if the whole apparatus is immersed in water of refractive index 4/3 without disturbing the geometrical arrangement, the new fringe width will be:

a. $0.4mm$
b. $0.3mm$
c. $0.1mm$
d. $0.2mm$

95. The second overtone of the closed organ pipe is 150 HZ more than the first overtone of closed pipe. what is the fundamental frequency of open organ pipe of same length?

a. 150 Hz
b. 300 Hz
c. 75 Hz
d. 450 Hz

96. The frequency heard by a stationary observer is double than that blown by source coming towards it. The velocity of source is (velocity of sound $= 340m/s$)

a. $680m/s$
b. $340m/s$
c. $170m/s$
d. $70m/s$

97. Two metals X and Y have work functions 2eV and 5eV respectively. Which metal will emit electrons when it is irradiated with light of wavelength 400 nm

a. only X
b. only Y
c. Both
d. None

98. If radioactive substance decays to $\left(\frac{1}{16}\right)^{th}$ of initial activity in 40 days. The half life of the radioactive substance expressed in minute is

a. 5000
b. 10
c. 864000
d. 14400

99. The ratio of number of alpha particle scattered through an angle of 60^o and 120^o is:

a. 1:9
b. 9:1
c. 1:3
d. 3:1

100. A soap bubble, having radius of 1 mm, is blown from a detergent solution having a surface tension of 2.5×10^{-2} N/m. The pressure inside the bubble equals at a point Z_0 below the free surface of water in a container. Taking $g = 10m/s^2$, density of water $= 10^3kg/m^3$, the value of Z_0 is :

a. 0.1 cm
b. 1 cm
c. 10 cm
d. 100 cm

Answer Key

1.c	2.d	3.a	4.a	5.b	6.b	7.c	8.c
9.d	10.d	11.a	12.b	13.b	14.c	15.d	16.c
17.a	18.d	19.d	20.b	21.b	22.d	23.a	24.a
25.b	26.c	27.c	28.a	29.c	30.b	31.c	32.c
33.d	34.a	35.a	36.d	37.a	38.d	39.c	40.c
41.c	42.c	43.a	44.c	45.b	46.c	47.b	48.c
49.b	50.a	51.c	52.c	53.b	54.a	55.c	56.a
57.a	58.d	59.c	60.b	61.c	62.c	63.a	64.b
65.a	66.a	67.a	68.d	69.b	70.a	71.b	72.c
73.a	74.b	75.c	76.b	77.b	78.a	79.a	80.c
81.a	82.c	83.b	84.c	85.d	86.d	87.a	88.d
89.a	90.c	91.c	92.d	93.d	94.b	95.a	96.c
97.a	98.d	99.b	100.b				

Solutions

1. c
2. d
3. a
4. a
5. b
6. b
7. c
8. c
9. d
10. d
11. a
12. b
13. b
14. c
15. d
16. c
17. a
18. d

19. d
20. b
21. b
22. d
23. a
24. a
25. b
26. c
27. c
28. a
29. c
30. b
31. c
32. c
33. d
34. a
35. a
36. d
37. a
38. d
39. c
40. c
41. c
42. c
43. a
44. c
45. b
46. c
47. b
48. c
49. b
50. a
51. c
52. c
53. b
54. a

55. c

56. a

57. a

58. d

59. c

60. b

61. c

62. c

63. a

64. b

65. a

66. a

67. a

68. d

69. b

70. a

71. b

72. c

73. a

74. b

75. c

76. b

77. b

78. a

79. a

80. c

81. a

82. c

83. b

84. c

85. d

86. d

87. a

88. d

89. a

90. c

91. c

92. d

93. d

94. b

95. a

96. c

97. a

98. d

99. b

100. b