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By Amit Katiyar (MCA;JNU)

1. A rod of length  $l$  is placed in a satellite which is moving with velocity  $0.8c$  relative to laboratory. The length of the rod as determined by the observer in the laboratory is
- 60 cm
  - 50 cm
  - 30 cm
  - 40 cm
2. The potential energy of a conservative system is given by  $U = ay^2 - by$ , where  $y$  represents the position of the particle while  $a$  and  $b$  are constants. The force acting on the system is
- $-ay$
  - $-by$
  - $2ay - b$
  - $b - 2ay$
3. A particle moves from position  $3\hat{i} + 2\hat{j} - 6\hat{k}$  to  $14\hat{i} + 13\hat{j} + 9\hat{k}$  meter, while a uniform force  $4\hat{i} + \hat{j} + 3\hat{k}$  acts on it. The work done by the force will be
- 10 Nm
  - 25 Nm
  - 50 Nm
  - 100 Nm
4. A body of rest mass  $m_0$  moving at speed  $v$  approaches an identical body at rest. Find  $V$ , the speed of a frame in which the total momentum is zero. Symbols have their usual meaning.
- $V = \frac{1}{2}v$
  - $V = v \frac{1-\gamma}{1+\gamma}$
  - $V = v \frac{1+\gamma}{1-\gamma}$
  - $V = v \frac{\gamma}{1+\gamma}$
5. Two rockets of rest length  $L_0$  are approaching the earth from opposite directions at velocities  $\pm \frac{c}{2}$ . How long does one of them appear to the other?
- $L' = \frac{3}{5}L_0$
  - $L' = \frac{1}{2}L_0$
  - $L' = \frac{3}{2}L_0$
  - $L' = \frac{2}{5}L_0$
6. A possible electrostatic field is given by  $\vec{E} = A[2xz\hat{i} - yz^2\hat{j} - (1+y^2z)\hat{k}]$  where  $A$  is constant with suitable dimensions. The charge density ( $\rho$ ) is given by
- $\epsilon_0 A(2 - x^2 - y^2)$
  - $\epsilon_0 A(2 - x^2 - z^2)$
  - $\epsilon_0 A(2 + x^2 + z^2)$
  - $\epsilon_0 A(2 - y^2 - z^2)$

7. In a series AC circuit, L, C and R are connected in series with an alternating voltage source of frequency,  $f$ . The current leads the voltage by  $45^\circ$ . The value of C is

- (a)  $\frac{1}{\pi f(2\pi fL + R)}$   
 (b)  $\frac{1}{2\pi f(2\pi fL - R)}$   
 (c)  $\frac{1}{\pi f(2\pi fL - R)}$   
 (d)  $\frac{1}{2\pi f(2\pi fL + R)}$

8. A solenoid 1 m long and radius 4 cm has 1000 turns and is carrying a current of 1 A. The value of the magnetic field, B at the centre of the solenoid will be

- (a)  $10.5 \times 10^{-4} \text{ T}$   
 (b)  $11.5 \times 10^{-4} \text{ T}$   
 (c)  $12.5 \times 10^{-4} \text{ T}$   
 (d)  $13.5 \times 10^{-4} \text{ T}$

Given : ( $\mu_0 = 4\pi \times 10^{-7}$  SI unit)

9. In Young double slit experiment an electron beam is used to obtain interference pattern. The slit width is  $d$ . If the speed of electron is increased, then

- (a) no interference pattern is observed  
 (b) fringe width increases  
 (c) fringe width decreases  
 (d) fringe width remains same

10. A ray of light is incident on the surface of a glass plate at an angle of incidence equal to Brewster's angle  $\phi$ . If  $\mu$  represents the refractive index of glass with respect to air, then the angle between reflected and refracted rays is

- (a)  $90^\circ + \phi$   
 (b)  $\sin^{-1}(\mu \cos \phi)$   
 (c)  $90^\circ$   
 (d)  $90^\circ - \sin^{-1}(\sin \phi / \mu)$

11. In a CE transistor amplifier, the load resistance in the collector circuit is  $4 \text{ k}\Omega$  and  $V_{CC} = 15 \text{ V}$ . Find the coordinates of the operating point for the zero signal base current  $20 \mu\text{A}$  and  $\beta = 100$ .

- (a)  $I_C = 2 \text{ mA}$ ,  $V_{CE} = 7 \text{ V}$   
 (b)  $I_C = 2 \text{ mA}$ ,  $V_{CE} = 4 \text{ V}$   
 (c)  $I_C = 3 \text{ mA}$ ,  $V_{CE} = 7 \text{ V}$   
 (d)  $I_C = 3 \text{ mA}$ ,  $V_{CE} = 4 \text{ V}$

12. An amplifier has an open loop gain of 800 and feedback ratio of 0.05. If the open loop gain changes by 20.5% due to temperature, find the % change in closed loop gain.

- (a) 0.5%  
 (b) 1.0%  
 (c) 1.5%  
 (d) 2.0%

13. In CE transistor amplifier, if  $\alpha = 0.98$ . Find the change in collector current for the change of 0.2 mA in base current
- 6.8 mA
  - 7.8 mA
  - 8.8 mA
  - 9.8 mA
14. Consider the function  $f(z) = \frac{z^2}{(z-1)^2(z+2)}$ , where  $|z| = 3$ , then the residues at each pole are
- $\frac{7}{9}, \frac{3}{5}$
  - $\frac{5}{9}, \frac{9}{9}$
  - $\frac{3}{7}, \frac{5}{6}$
  - $\frac{7}{9}, \frac{5}{9}$
15. The value of the integral  $\int_c \frac{4-3z}{z(z-1)(z-2)} dz$  where  $c$  is the circle  $|z| = 3/2$  is
- $-\pi i$
  - $\pi i$
  - $2\pi i$
  - $-2\pi i$
16. The number of nuclei of radioactive substance at time  $t = 0$  are 1000 and at time  $t = 2$  sec are 900. Then the number of nuclei at time  $t = 4$  sec will be
- 700
  - 790
  - 800
  - 810
17. Radioactive decay can form an isotope of original nucleus with the emission of particles
- one  $\alpha$  and four  $\beta$
  - one  $\alpha$  and two  $\beta$
  - one  $\alpha$  and one  $\beta$
  - four  $\alpha$  and one  $\beta$
18. Bragg diffraction is not observed for visible light because
- visible light is not intense
  - wavelength of visible light is not comparable to interatomic separation
  - visible light is not monochromatic
  - visible light polarizes
19. Phase shift through an op. amp. is caused by
- the internal RC circuit
  - the external RC circuit
  - the gain roll-off
  - negative feedback

20. Angular width of central maximum of a diffraction pattern of a single slit does not depend upon
- distance between slit and source
  - wavelength of light used
  - width of the slit
  - frequency of light used
21. Which one of the following array represents a binary max-heap?
- {25, 12, 16, 13, 10, 8, 14}
  - {25, 14, 13, 16, 10, 8, 12}
  - {25, 14, 16, 13, 10, 8, 12}
  - {25, 14, 12, 13, 10, 8, 16}
22. The in order and pre order traversal of a binary tree are *d b e a f c g* and *a b d e c f g*  
The post order traversal of the binary tree is
- d e b f g c a*
  - e d b g f c a*
  - e d b f g c a*
  - d e f g b c a*
23. Which one of the following is true for any simple connected undirected graph with more than 2 vertices ?
- No two vertices have the same degree
  - At least two vertices have the same degree
  - At least three vertices have the same degree
  - All the vertices have the same degree
24. Thread is a
- heavy weight process
  - light weight process
  - suspended process
  - resumed process
25. A system program that combines the separately compiled modules of a program into a form suitable for execution
- assembler
  - linker
  - cross compiler
  - load and go
26. The data structure needed to convert infix notation to postfix notations is
- linear list
  - queue
  - tree
  - stack
27. Part of the operating system that handles users interface is referred as
- Shell
  - Kernel
  - Anti-spam engine
  - None of the above
28. Portion of operating system that manages interaction with hardware is referred to as
- Shell
  - Kernel
  - Anti-spam engine
  - None of the above

29. Moving a process from main memory to disk is called
- (a) Swapping
  - (b) Caching
  - (c) Spooling
  - (d) Buffering
30. Back patching is used to tackle the problem of
- (a) Backward references
  - (b) Forward references
  - (c) Top references
  - (d) Bottom references
31. A pointer is
- (a) A keyword used to create variables
  - (b) A variable that stores address of an instruction
  - (c) A variable that stores address of other variable
  - (d) All of the above
32. The only state transition by the user process itself in an operating system is
- (a) Block
  - (b) Dispatch
  - (c) Timer runoff
  - (d) Wake up
33. A function that returns no values to the program that calls it is
- (a) not allowed in C++
  - (b) type void
  - (c) type empty
  - (d) type barren
34. The strategy of allowing processes that are logically runnable to be temporarily suspended is called
- (a) pre-emptive scheduling
  - (b) non-pre-emptive scheduling
  - (c) shortest job first
  - (d) first come first served
35. An optical input device that interprets pencil marks on paper media is
- (a) O.M.R.
  - (b) Punch card reader
  - (c) Optical scanners
  - (d) Magnetic tape
36. The time required for the fetching and execution of one simple machine instruction is
- (a) Delay time
  - (b) CPU cycle
  - (c) Real time
  - (d) Seek time
37. Which of the following is the 1's complement of 10 ?
- (a) 01
  - (b) 110
  - (c) 11
  - (d) 10

38. What is the name given to the organized collection of software that controls the overall operation of a computer?

- (a) Working system
- (b) Peripheral system
- (c) Operating system
- (d) Controlling system

39. The main function of the dispatcher is

- (a) Transferring a process to the disk
- (b) Assigning ready process to the CPU
- (c) Suspending some of the processes when the CPU load is high
- (d) Bring processes from the disk to the main memory

40. The following postfix expression with single-digit operands is evaluated using a stack

$$8 2 3^{\wedge} / 2 3 * + 5 1 * -$$

Note that  $\wedge$  is the exponentiation operator. The top two elements of the stack after the first  $*$  is evaluated are

- (a) 6, 1
- (b) 5, 7
- (c) 3, 2
- (d) 1, 5

41. Find out the missing term

$$\begin{array}{ccc} & 8 & \\ 3 & \boxed{15} & S \\ & 9 & \end{array} \quad \begin{array}{ccc} & 14 & \\ 6 & \boxed{18} & D \\ & 3 & \end{array} \quad \begin{array}{ccc} & S & \\ ? & \boxed{8} & K \\ & 6 & \end{array}$$

- (a) 9
- (b) 3
- (c) 6
- (d) 2

42. If EARN is written as GCTP, how is NEAR written in the code below

- (a) CTGP
- (b) GPTC
- (c) PGCT
- (d) PCGT

43. Which of the options given below would replace the question mark in series MNAZ LOBY KPCX JQDW ....?.....

- (a) IREV
- (b) HITU
- (c) JKST
- (d) HJEV

44. A person walks 10 m in front and 10 m to the right. Then every time turning to his left, he walks 5, 15 and 15 m respectively. How far is he now from his starting point ?
- 20 m
  - 15 m
  - 10 m
  - 5 m
45. Asha is taller than Shashi, Shashi is shorter than Vatsala. Mohini is taller than Asha. If Vatsala's height is 5'3", who is the tallest of all?
- Shashi
  - Asha
  - Mohini
  - Vatsala
46. At what time between 3 o'clock and 4 o'clock will the hand of clock be together?
- $16\frac{3}{11}$  min. past 3
  - $14\frac{3}{11}$  min. past 3
  - $13\frac{2}{11}$  min. past 3
  - $16\frac{4}{11}$  min. past 3
47. Choose the antonym of the word 'Acquit'
- Convict
  - Exonerate
  - Restrain
  - Entrap
48. A program that performs a useful task while simultaneously allowing destructive acts is a
- Worm
  - Trojan horse
  - Virus
  - Macro virus
49. Collecting personal information and effectively posing as another individual is known as the crime of
- Spooling
  - Identify theft
  - Spoofing
  - Hacking
50. Which of the following letters is 14<sup>th</sup> to the right of 6<sup>th</sup> letter from the left in the English alphabet?
- R
  - P
  - W
  - T

51. A complete integral of  $z(p^2 - q^2) = x - y$  is

(a)  $z^{3/2} = (x+a)^{3/2} - (y+a)^{3/2} + b$

(b)  $z^{3/2} = (x+a)^{3/2} + (y+a)^{3/2} + b$

(c)  $z^{1/2} = (x+a)^{1/2} - (y+a)^{1/2} + b$

(d)  $z^{1/2} = (x+a)^{1/2} + (y+a)^{1/2} + b$

52. The Laplace transform of  $x^n e^{-ax}$  is

(a)  $\frac{|n|}{(s+a)^{n+1}}$

(b)  $\frac{|n+1|}{(s-a)^{n+1}}$

(c)  $\frac{|n|}{(s-a)^n}$

(d)  $\frac{|n|}{(s+a)^n}$

53. Let  $A$  be a square matrix of order 3 with all eigen values 1, 1 and  $-1$ , then the determinant of  $I + (\text{adj}A)^{100}$  is

(a) 10

(b) 8

(c) 20

(d) 16

54.  $\int_0^{\pi/2} \log \sin x \, dx$  equals

(a)  $\frac{\pi}{2} \log_e \left(\frac{1}{2}\right)$

(b)  $\frac{\pi}{2} \log_{10} \left(\frac{1}{2}\right)$

(c)  $2\pi \log_e(2)$

(d)  $\frac{\pi}{2} \log_e(2)$

55. The largest order of an element in  $S_{10}$  (group of permutations) is

(a) 18

(b) 9

(c) 30

(d) 21

56. Which of the following statements is incorrect?

(a) Every abelian group is cyclic

(b) Every cyclic group is abelian

(c) Every non-abelian group has a non-trivial abelian subgroup

(d) Every non-abelian finite group has a non-trivial cyclic subgroup

57.  $\sin^{-1}\left(\frac{dy}{dx}\right) = x + y$ , then

(a)  $x = 2\left(1 + \tan\frac{x+y}{2}\right) + C$

(b)  $x\left(1 + \tan\frac{x+y}{2}\right) + 2 = C$

(c)  $y\left(1 + \tan\frac{x+y}{2}\right) + 2 = C$

(d)  $x = 2\left(1 - \tan\frac{x+y}{2}\right) + C$

58. A student pedals from his home to the college at the speed of 10 km/hour and back at the speed of 15 km/hour. Then his average speed in km/hour is.

(a) 12

(b) 12.2

(c) 12.5

(d) 13

59. The general solution of the differential equation  $p^2 - 5p + 6 = 0$  is

(a)  $(y - 3x - c_1)(y - 2x - c_2) = 0$

(b)  $(3x + y - c_1)(2y + x - c_2) = 0$

(c)  $(y + 3x - c_1)(y + 2x - c_2) = 0$

(d)  $(y - x - c_1)(y + x - c_2) = 0$

60. The medians of curvature of the curve  $y = e^x$  at the point where it crosses the y-axis is.

(a) 2

(b)  $\sqrt{2}$

(c)  $2\sqrt{2}$

(d)  $\sqrt{2}/2$

61. If  $\vec{a}, \vec{b}, \vec{c}$  are three non-zero and non-coplanar vector such that  $\vec{a} \cdot \vec{b} = 0$  and  $\vec{b} \cdot \vec{c} = 0$ , then

(a)  $\vec{a} \cdot \vec{c} = 0$

(b)  $\vec{a} \cdot \vec{c} \geq 0$

(c)  $\vec{a} \cdot \vec{c} \leq 0$

(d)  $\vec{a} \cdot \vec{c} \neq 0$

62. Let  $T: \mathbb{R}^3 \rightarrow \mathbb{R}^3$  be the linear operator defined by  $TX = AX$  where,

$$A = \begin{bmatrix} 1 & 3 & 4 \\ 3 & 4 & 7 \\ -2 & 2 & 0 \end{bmatrix} \text{ and } X = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix},$$

then the range of  $T$  and kernel of  $T$  are given by

(a) A line and a plane passing through the origin respectively

(b) Two planes passing through the origin

(c) A plane and a line passing through the origin respectively

(d) Two lines passing through the origin

63. The complete integral of  $x^2 p^2 + y^2 q^2 = z$  is

(a)  $(xy)^{\sqrt{1-a^2}} = b_c 2\sqrt{z}$

(b)  $x^a y^{\sqrt{1-a^2}} = b e^{2\sqrt{z}}$

(c)  $x^a y^{\sqrt{1-a^2}} = b \log z$

(d)  $xy = a e^{2\sqrt{z}}$

64. Condition for the cone  
 $ax^2 + by^2 + cz^2 + 2fyz + 2gzx + 2hxy = 0$   
 may have three mutually perpendicular generators is
- (a)  $a - b + c = 0$   
 (b)  $a + b + c = 1$   
 (c)  $a - b - c = 0$   
 (d) None of these

65. No of solutions of the D.E.

$$\left| \frac{dy}{dx} \right| + |y| + c = 0, \text{ are}$$

- (a) Unique  
 (b) Infinite  
 (c) No solution  
 (d) None of these
66.  $\lim_{(x,y) \rightarrow (0,0)} \frac{x^2 - xy}{\sqrt{x} - \sqrt{y}}$
- (a) Not exists  
 (b) 0  
 (c) 1  
 (d) 2

67. Solution of the partial differential equation

$$\frac{\partial^2 z}{\partial x^2} + 6 \frac{\partial^2 z}{\partial x \partial y} + 9 \frac{\partial^2 z}{\partial y^2} = 0$$

- (a)  $z = f_1(3y - x) + f_2(3y - x)$   
 (b)  $z = f_1(y - 3x) + f_2(y - 3x)$   
 (c)  $z = f_1(y + 3x) + f_2(y - 3x)$   
 (d)  $z = f_1(y - 3x) + x f_2(y - 3x)$

68. The general solution of the differential equation  
 $xy(p^2 + 1) = (x^2 + y^2)p$  is
- (a)  $(y - cx)(x^2 - y^2 - c) = 0$   
 (b)  $(y - c - x)(xy - c) = 0$   
 (c)  $(y - x - c)(x^2 + y^2 - c) = 0$   
 (d)  $(x^2 y - c)(y - cx^2) = 0$

69. The centre of the sphere through the four points  $(0, 0, 0)$ ,  $(2, 0, 0)$ ,  $(0, 4, 0)$  and  $(0, 0, 6)$  is
- (a)  $(1, 2, 3)$   
 (b)  $(0, 1, 2)$   
 (c)  $(1, 1, 2)$   
 (d)  $(1, 3, 2)$

70.  $\left[ \frac{a \times b}{b \times c} \frac{c \times a}{a} \right] =$

- (a)  $2 \left[ \frac{a}{b} \frac{b}{c} \frac{c}{a} \right]$   
 (b)  $3 \left[ \frac{a}{b} \frac{b}{c} \frac{c}{a} \right]$   
 (c)  $\left[ \frac{a}{b} \frac{b}{c} \frac{c}{a} \right]^2$   
 (d) zero

71.  $\int \frac{xe^x}{(x+1)} dx =$

- (a)  $e^x$   
 (b)  $(x+1)e^x$   
 (c)  $\frac{1}{(x+1)} e^x$   
 (d)  $(x-1)^2 e^x$

72. If tangents be drawn to the parabola  $y^2 = 4ax$  from a point on the line  $x + 4a = 0$ , their chord of contact will subtend the angle at vertex, which is of
- $30^\circ$
  - $60^\circ$
  - $90^\circ$
  - $45^\circ$
73. Solution of  $(x-a)p^2 + (x-y)p - y = 0$  is
- $y = cx - \frac{(ac^2)}{(c+1)}$
  - $y = cy + \frac{(ac^2)}{(x+1)}$
  - $y = cx - \frac{(ac^2)}{(y+1)}$
  - $y = cy - \frac{(ac^2)}{(c+1)}$
74. If  $\vec{a} = 2\hat{i} - 3\hat{j}$ ,  $\vec{b} = \hat{i} + \hat{j} - \hat{k}$ ,  $\vec{c} = 3\hat{i} - \hat{k}$ , then  $\vec{a} \cdot (\vec{b} \times \vec{c})$  is equal to
- 1
  - 2
  - 3
  - 4
75. The eq<sup>n</sup> of the right circular cylinder describing on the circle through the three points  $(1, 0, 0)$ ,  $(0, 1, 0)$ ,  $(0, 0, 1)$  as the guiding circle is  $x^2 + y^2 + z^2 - 1 = f(x, y, z)$ , then  $f(x, y, z) =$
- $xy + yz + zx - 1$
  - $2x + 2y + 2z - 1$
  - $2xy + 2yz + 2zx$
  - $xy + yz + zx$
76. P.I. of the differential equation  $(D+2)(D-1)^3y = e^x$  is
- $\frac{1}{18}x^3e^x$
  - $x^3e^x$
  - $\frac{1}{3}x^3e^x$
  - $\frac{1}{12}x^3e^x$
77.  $F(x, y, z) = z\hat{i} + xy\hat{j} - y^2\hat{k}$  along the curve C given by  $r(t) = t^2\hat{i} + t\hat{j} + \sqrt{t}\hat{k}$ ,  $0 \leq t \leq 1$  then  $\int_C F \cdot dr$  is
- $\frac{20}{17}$
  - $\frac{22}{7}$
  - $\frac{17}{20}$
  - None of these
78. Common area to the circle  $x^2 + y^2 = 4$  and the ellipse  $x^2 + 4y^2 = 9$  is
- $4\pi + 9\sin^{-1}\frac{\sqrt{7}}{3\sqrt{3}} - 8\sin^{-1}\frac{\sqrt{7}}{2\sqrt{3}}$
  - $4\pi$
  - $4\pi - 3\sin^{-1}\frac{\sqrt{7}}{3\sqrt{3}} + 2\sin^{-1}\frac{\sqrt{7}}{2\sqrt{3}}$
  - None of these

79. The length of latus rectum of the parabola  $(a^2 + b^2)(x^2 + y^2) = (bx + ay - ab)^2$ , is
- $2ab$
  - $ab$
  - $\frac{-ab}{\sqrt{a^2 + b^2}}$
  - $\frac{2ab}{\sqrt{a^2 + b^2}}$
80. The product of two orthogonal matrices is a
- Unitary matrix
  - Orthogonal matrix
  - Unit matrix
  - None of these
81. The set  $M$  of all  $n \times n$  matrices over the field of reals  $\mathbb{R}$ , is a vector space over  $\mathbb{R}$  under usual operations. The dimension of  $M$  over  $\mathbb{R}$  is
- 1
  - $n$
  - $n^2$
  - $n + 1$
82. A complete integral of  $p^2 + q^2 = z^2(x + y)$  is
- $\log z = (2/3) \times [(a+x)^{3/2} + (y-a)^{3/2} + b]$
  - $\log z = (2/3) \times [(a+x)^{3/2} - (y-a)^{3/2} + b]$
  - $\log z = (2/3) \times [(a+x)^{1/2} + (y-a)^{1/2} + b]$
  - $\log z = (2/3) \times [(a+x)^{1/2} - (y-a)^{1/2} + b]$
83. The volume of the tetrahedron bounded by the plane  $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$ ,  $a, b, c > 0$  and the coordinate planes is equal to
- $\frac{1}{3}\pi abc$
  - $\frac{2}{3}\pi abc$
  - $\frac{1}{6}abc$
  - $\frac{1}{2}abc$
84. The area of the cardioid  $r = a(1 + \cos \theta)$  is given by
- $2 \int_0^\pi \int_{r=0}^{a(1+\cos \theta)} r dr d\theta$
  - $2 \int_0^\pi \int_{r=a}^{a(1+\cos \theta)} r dr d\theta$
  - $2 \int_0^{\pi/2} \int_{r=0}^{a(1+\cos \theta)} r dr d\theta$
  - $2 \int_0^{\pi/4} \int_{r=0}^{a(1+\cos \theta)} r dr d\theta$
85. The solution of  $(y - xy^2)dx - (x + x^2y)dy = 0$  is
- $\log \frac{x}{y} - xy = C$
  - $\log xy - xy = C$
  - $\log \frac{x}{y} - \frac{x}{y} = C$
  - $\log xy - \frac{x}{y} = C$

86. While analysing the data in  $5 \times 5$  latin square design, the error degree of freedom in analysis of variance is equal to
- 25
  - 12
  - 16
  - 24
87. Let  $X_1, X_2, \dots, X_n$  are independently and identically distributed from  $N(\mu, \sigma^2)$ , then maximum likelihood estimator of  $\sigma^2$ , (when  $\mu$  is unknown) is given by
- $S^2 = \frac{1}{n} \sum_{i=1}^n (X_i - \bar{X})^2$
  - $S^2 = \frac{1}{(n-1)} \sum_{i=1}^n (X_i - \bar{X})^2$
  - $S = \sqrt{\frac{1}{n} \sum_{i=1}^n (X_i - \bar{X})^2}$
  - $S = \sqrt{\frac{1}{(n-1)} \sum_{i=1}^n (X_i - \bar{X})^2}$
88. In stratified random sampling
- Sample mean is unbiased estimator for population mean
  - Weighted sample mean (with weight  $\frac{N_i}{N}$  for  $i^{\text{th}}$  stratum) is unbiased estimator for population mean
  - Weighted sample mean (with weight  $\frac{n_i}{n}$  for  $i^{\text{th}}$  stratum) is unbiased estimator for population mean
  - None of the above
89. Let  $X_1, X_2, \dots, X_n$  be a random sample from a Poisson distribution  $P(\lambda)$ . Then the maximum likelihood estimator of  $\lambda$  is
- Median
  - Mode
  - Geometric mean
  - Arithmetic mean
90. The formula for estimating one missing value in RBD having  $b$  blocks and  $k$  treatments with usual notation is
- $\frac{bT' + kB' - G'}{(b-1)(k-1)}$
  - $\frac{bB' + bT' - G'}{(b-1)(k-1)}$
  - $\frac{bT' + kB' - kG'}{(b-1)(k-2)}$
  - $\frac{bB' + kT' - G'}{(b-1)(k-1)}$
91. Mary has two children. One child is a boy. What is the probability that other child is a girl?
- $\frac{2}{3}$
  - $\frac{1}{2}$
  - $\frac{1}{3}$
  - $\frac{1}{4}$

92. Let 0.7, 1.5, 0.3, 0.5 and 3.4 be a random sample of size 5 from a distribution having p.d.f.

$$f(x; \theta) = \theta e^{-\theta x}, x > 0, \theta > 0.$$

The m.l.e. of  $\theta$  is

- (a)  $\frac{25}{32}$   
(b)  $\frac{32}{25}$   
(c)  $\frac{32}{5}$   
(d)  $\frac{5}{32}$

93. If the moment generating function of  $X$  is given by  $M_x(t) = (0.6e^t + 0.4)^8$  then the variance of  $X$  is

- (a) 0.32  
(b) 0.48  
(c) 1.92  
(d) 0.24

94. A coin is tossed until a head appears. The expected number of tosses is

- (a) 7  
(b) 2  
(c)  $\frac{1}{2}$   
(d) 1

95. If  $X$  is the discrete random variable with distribution function

$$F(x) = \begin{cases} 0 & \text{if } x < 0 \\ \frac{1}{4} & \text{if } 0 \leq x < 1 \\ \frac{3}{4} & \text{if } 1 \leq x < 2 \\ 1 & \text{if } x \geq 2 \end{cases}$$

then  $P(X=1)$  is

- (a)  $\frac{1}{2}$   
(b)  $\frac{1}{4}$   
(c)  $\frac{3}{4}$   
(d)  $\frac{1}{3}$

96. In a RBD experiment with 5 treatments and 5 blocks. The degree of freedom for error in ANOVA table is

- (a) 25  
(b) 16  
(c) 20  
(d) 15

97. If  $n$  units are selected in a sample from  $N$  population units, the sampling fraction is given as

- (a)  $\frac{N}{n}$   
(b)  $\frac{1}{N}$   
(c)  $\frac{1}{n}$   
(d)  $\frac{n}{N}$

98. Replication in an experiment means

- (a) the number of blocks
- (b) total number of treatments
- (c) the number of times a treatment occurs in an experiment
- (d) none of the above

99. Let  $X_1, X_2, \dots, X_n$  be a random sample drawn from the population with density

$$f(x) = \begin{cases} 1 & \text{if } \theta < x < \theta + 1 \\ 0 & \text{otherwise} \end{cases}$$

Then the sample mean  $\bar{X}$  is an unbiased estimator of

- (a)  $\theta$
- (b)  $\theta + 1$
- (c)  $\theta - 1$
- (d)  $\theta + \frac{1}{2}$

100. Which of the following is a contrast ?

- (a)  $3T_1 + T_2 - 3T_3 + T_4$
- (b)  $T_1 + 3T_2 - 3T_3 + T_4$
- (c)  $-3T_1 - T_2 + T_3 + 3T_4$
- (d)  $T_1 + T_2 + T_3 - T_4$

ANSWER SECTION

41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200
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