P.G. MATHEMATICS

1. If $T(x) = \int_{x^2}^{0} \sqrt{u}du$, then $\frac{dT}{dx}$ is

(A) $\sqrt{x}$ (B) $2x^2$ (C) 1 (D) 0

2. The interval in which the Lagrange's Theorem is applicable for the function $f(x) = 1/x$ is

(A) $[-3, 3]$ (B) $[-2, 2]$ (C) $[2, 3]$ (D) $[-1, 1]$

3. The limit of the series $f(x) = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \cdots$ as x approaches $\pi/2$ is

(A) $2\pi/3$ (B) $\pi/3$ (C) $\pi/2$ (D) 1

4. The directional derivative of $f(x, y, z) = x^2 + y^2 + z^2$ at the point $(1, 1, 1)$ in the direction $\hat{i} - \hat{k}$ is

(A) 1 (B) 0 (C) $\sqrt{2}$ (D) $2\sqrt{2}$

5. $\lim_{a \to \infty} \int_1^a x^{-4} dx$

(A) diverges

(B) converges to $1/3$

(C) converges to $-1/a^3$

(D) converges to 0

6. Consider the following two statements I. The maximum number of linerly independent column vectors of a matrix A is called the rank of A. II. If A is an $n \times n$ square matrix, it will be non singular if $rank(A) = n$. With reference to the above statements, which of the following applies ?

(A) Both the statements are false

(B) Both the statements are true

(C) I is true but II is false

(D) I is false but II is true

7. The system of equations : $(4d-1)x+y+z=0$, $-y+z=0$ and $(4d-1)z=0$ has a non-trivial equation, if d equals

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

8. The rank of a 3×3 matrix $C=AB$ found by multiplying a non-zero column matrix A of size 3×1 and a non-zero row matrix B of size 1×3, is

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

9. Eigen values of a real skew-symmetric are always

(A) Real and positive

(B) Real and negative

(C) Purely imaginary or zero

(D) purely imaginery or positive

10. If A and B are real symmetric matrices of size $n \times n$, then

(A) $AA^T = I$

(B) $A = A^{-1}$

(C) $AB = BA$

(D) $(AB)^T = BA$

11. Rank of a matrix $A = \begin{bmatrix} 1 & 4 & 8 & 7 \\ 0 & 0 & 3 & 0 \\ 4 & 3 & 2 & 1 \\ 3 & 12 & 24 & 2 \end{bmatrix}$ is

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

12. The determinant of the matrix $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 100 & 1 & 0 & 0 \\ 100 & 200 & 1 & 0 \\ 100 & 200 & 300 & 1 \end{bmatrix}$

(A) 100 (B) 200 (C) 1 (D) 0

(Continued)

13. The convex combintion of three linearly independent vectors in a space will be a locus of

(A) Line segment (B) Triangle

(C) Circle (D) None of these

14. Which is the correct statement

(A) Every subset of a linearly independent set is linearly independent

(B) Every superset of linearly idependent set is linearly independent

(C) Every subset of a linearly dependent set is linearly dependent

(D) Every superset of a linearly dependent set is linearly independent.

15. Which one is correct ?

Let V be a linear space, the metric defined by norm

(A) $d: V \times V \to R$ then $d(x,y) = \| x - y \|$ for $x, y \in V$

(B) $d: V \times V \to R$ then $d(x,y) = \| x + y \|$ for $x, y \in V$

(C) $d: V \times V \to R^n$ then $d(x,y) = \| x^n + y^n \|$ for $x, y \in V$

(D) $d: V \times V \to Q$ then $d(x,y) = | x + y |$ for $x, y \in V$

16. The round-off error when the number 8.987652 is rounded to five significant digits is

(A) $-0{\cdot}00043$ (B) -0.000048 (C) $0{\cdot}00048$ (D) $0{\cdot}00480$

17. If the bisection method is used to find a root of $x^3 + 7x^2 - x - 7 = 0$ in the interval $[a, b]$ then a and b are

(A) -6 and -4 (B) -4 and -2 (C) 0 and 2 (D) 4 and 6

18. Newton-Raphson method is used to find the root of the equation $x^2 - 2 = 0$. If the iterations are started from -1, then iterations will be

(A) Converges to -1 (B) Converges to $\sqrt{2}$

(C) Converges to $-\sqrt{2}$ (D) Converges to 1

(*Turn Over*)

19. Newton iterative formula to find $\sqrt{N}$ is

(A) $x_{n+1} = x_n(2 - Nx_n)$ (B) $x_{n+1} = x_n(2 + Nx_n)$

(C) $x_{n+1} = (x_n - N/x_n)/2$ (D) None of the above

20. From the given table

X	1	2	3	4
$f(x)$	4	7	17	31

the interpolated value of $f(1\cdot5)$ is

(A) 4·5 (B) 4 (C) 3·5 (D) 4·6

21. The quadrature formula

$$\int_{-1}^{+1} f(x)dx = \frac{1}{9}\left[5f\left(-\sqrt{\frac{3}{5}}\right) + 8f(0) + 5f\left(\sqrt{\frac{3}{5}}\right)\right]$$

is exact for polynomials of degree less than or equal to

(A) Three (B) Four (C) Five (D) Six

22. Which one is correct

(A) $\Delta^2 = E^2 + 2E + I$ (B) $\Delta^2 = E^2 + I$

(C) $\Delta^2 = E^2 - 2E + I$ (D) $\Delta^2 = E^2 - I$

23. The order of convergence of secant method is

(A) $1 - \sqrt{2}$ (B) $1 + \sqrt{2}$ (C) $\frac{1-\sqrt{5}}{2}$ (D) $\frac{1+\sqrt{5}}{2}$

24. The order of error in the Simpson's rule for numerical integration with a step size h is

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

(*Continued*)

25. Error may occurs in performing numerical computation on the computer due to

(A) Rounding errors
(B) Power fluctuation
(C) Operator fatigue
(D) All of these

26. A basic solution to the system $AX = b$ is called degenerate if

(A) A most one of the basic variables vanish
(B) Exactly one of the basic variables vanish
(C) At least one of the basic variable vanish
(D) None

27. If a and b are lements of a group G, then $(ba)^{-1} =$

(A) $b^{-1}a^{-1}$
(B) $a^{-1}b^{-1}$
(C) $a^{-1}b$
(D) $b^{-1}a$

28. How many elements of order 5 are there in S_7 ?

(A) 204
(B) 304
(C) 404
(D) 504

29. If the vector $\vec{f} = (x+3y)\hat{i} + (y-2z)\hat{j} + (x+az)\hat{k}$ is solenoidal, the value of a is

(A) 2
(B) 1
(C) – 2
(D) 0

30. The partial derivative of the function $f(x,y,z) = e^{1-x\cos y} + ze^{-1/(1+y^2)}$ with respect to x at the point $(1, 0, \pi)$ is

(A) -1
(B) $-1/e$
(C) 0
(D) π/e

31. Evaluate $\lim_{(x,y)\to(0,0)} \frac{xy}{x^2+y^2}$.

(A) -1
(B) 0
(C) $1/2$
(D) Does not exists

(Turn Over)

32. The rate of convergence of Gauss Seidel Methods is _____ that of Gauss Jacobi Method.

(A) Once (B) Twice

(C) Thrice (D) Reciprocal

33. The Prime Numer Theorem says that, if $p(x)$ denotes the number of primes less then or equal to x, then

(A) $\lim_{n\to\infty} \pi(x) \Big/ \dfrac{x}{\ln x} = \infty$ (B) $\lim_{n\to\infty} \pi(x) \Big/ \dfrac{x}{\ln x} = 2$

(C) $\lim_{n\to\infty} \pi(x) \Big/ \dfrac{x}{\ln x} = 1$ (D) $\lim_{n\to\infty} \pi(x) \Big/ \dfrac{x}{\ln x} = 0$

34. If p is a prime and $p|ab$, then

(A) $p|a$ or $p\nmid b$ (B) $p|a$ or $p|b$

(C) $p\nmid a$ or $p|b$ (D) $p\nmid a$ or $p\nmid b$

35. If $a \equiv b \pmod m$ and $c \equiv d \pmod m$, then I. $ac \not\equiv bd \pmod m$ and II. $a^n \equiv b^n \pmod m$, $\forall n \geq 1$. With referenc to the above statements, which of the following applies ?

(A) I and II are true (B) I is true but II is false

(C) I and II are false (D) I is false but II is true

36. Which one of the following is the correct statement of "Fermat's Little Theorem". If p is a prime and a is relatively prime to p, then

(A) $a^{p-1} \equiv -1 \pmod p$ (B) $a^{p-1} \equiv 1 \pmod p$

(C) $a^{p-1} \equiv \mp 1 \pmod p$ (D) $a^{p-1} \equiv 0 \pmod p$

37. Let a relation R be defined over the set of rational number Q by $a\ R\ b$ if $a > b$. Then this relation R is

(A) reflexive, but not symmetric and transitive

(B) symmetric, but not reflexive and transitive

(C) transitive, but not reflexive and symmetric

(D) not transitive, but reflexive and symmetric

38. Which is not necessarily a normal subgroup of a group G ?

(A) G

(B) $\{e\}$, where e is the identity element of G

(C) The centre Z of G

(D) The normaliser of an element $a \in G$

39. The number of elements in the alternating group A_5 is

(A) 15 (B) 30 (C) 60 (D) 120

40. Which group is not abelian ?

(A) A cyclic group

(B) Symmetric group S_n

(C) A group of 4 elements

(D) A group G for which $(ab)^2 = a^2b^2, \forall a, b \in G$

41. Let H and K be finite subgroups of a group G. Then $o(HK)$ is equal to

(A) $o(H) + o(k)$

(B) $o(H) \cdot o(K)$

(C) $\dfrac{o(H) \cdot o(K)}{o(H \cap K)}$

(D) $o(H) \cdot o(K) - o(H \cap K)$

42. If the characteristic values of a square matrix of third order are 2, 3, 4, then the value of its determinant is

(A) 6 (B) 9 (C) 24 (D) 54

43. Which one of the following is a subspace of the vector space $\mathbb{R}^3$?

(A) $\{(x, y, z) \in \mathbb{R}^3 : x + 2y = 0,\ 2x + 3z = 0\}$

(B) $\{(x, y, z) \in \mathbb{R}^3 : 2x + 3y + 4z - 3 = 0,\ z = 0\}$

(C) $\{(x, y, z) \in \mathbb{R}^3 : x \geq 0,\ y \geq 0\}$

(D) $\{(x, y, z) \in R^3 : x - 1 = 0,\ y = 0\}$

44. Let G be a group of order 17. The total number of non-isomorphic subgroup(s) of G is

(A) 1 (B) 2 (C) 3 (D) 17

45. Let a, b, c, d be distinct non-zero real numbers with $a + b = c + d$. Then an eigenvalue of the matrix $\begin{bmatrix} a & b & 1 \\ c & d & 1 \\ 1 & -1 & 0 \end{bmatrix}$ is

(A) $a + c$ (B) $a + b$ (C) $a - b$ (D) $b - d$

46. Solution of $235\,x \equiv 54 \pmod 7$ is

(A) $x \equiv 12 \pmod 7$ (B) $x \equiv 3 \pmod 7$

(C) $x \equiv 5 \pmod 7$ (D) $x \equiv 4 \pmod 7$

47. If the matrix $\begin{bmatrix} 6 & 8 & 5 \\ 4 & 2 & 3 \\ 9 & 7 & 1 \end{bmatrix}$ is expressed as $A + B$, where A is symmetric and B is skew symmetric, then B is equal to

(A) $\begin{bmatrix} 0 & 2 & -2 \\ -2 & 0 & -2 \\ 2 & 2 & 0 \end{bmatrix}$ (B) $\begin{bmatrix} 0 & -2 & 2 \\ 2 & 0 & 2 \\ -2 & -2 & 0 \end{bmatrix}$

(C) $\begin{bmatrix} 6 & 6 & 7 \\ 6 & 2 & 5 \\ 7 & 5 & 1 \end{bmatrix}$ (D) $\begin{bmatrix} 6 & 6 & 7 \\ 6 & 2 & 5 \\ 1 & 5 & 7 \end{bmatrix}$

48. For the matrix $A = \begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$, A^{-1} is equal to

(A) I (B) A (C) $-A$ (D) $2A$

49. The coefficient of x^4 in the Maclaurin's expansion of log cosx is

(A) $\frac{-1}{24}$ (B) $\frac{-1}{12}$ (C) $\frac{-1}{45}$ (D) $\frac{-1}{6}$

50. The coefficient of $(x-1)^2$ in the Taylor series expansion of $f(x) = xe^x (x \in R)$ about the point $x = 1$ is

(A) $\frac{e}{2}$ (B) $2e$ (C) $\frac{3e}{2}$ (D) $3e$

51. The correct inequality for the modulus of the difference of two complex numbers Z_1 and Z_2 is

(A) $|Z_1 - Z_2| \geq |Z_1| - |Z_2|$ (B) $|Z_1 - Z_2| > |Z_1| + |Z_2|$

(C) $|Z_1 - Z_2| \leq |Z_1| - |Z_2|$ (D) $|Z_1 - Z_2| \geq |Z_1||Z_2|$

52. The function $f(z) = |z|^2$ is

(A) differentiable everywhere (B) differentiable nowhere

(C) differentiable at the origin only (D) differentiable at $z = 0$ and $z = i$

53. Writing mean value theorem as $f(b) - f(a) = (b - a)f'(c)$, $a < c < b$, the value of c, if $f(x) = x(x - 2)$, $a = 0$, $b = 1$, is

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

54. The value of $\lim\limits_{(x,y)\to(2,-2)} \frac{\left(\sqrt{(x-y)}\right)-2}{x-y-4}$ is

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

55. The number of asymptotes of the curve $x^2y^2 = a^2(x^2 + y^2)$ is

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

(Turn Over)

56. The curve $r = a \sin 5\theta$ has

(A) 1 loops (B) 3 loops (C) 5 loops (D) 10 loops

57. If u is a homogeneous function of x and y of degree n, then the value of $x\dfrac{\partial^2 u}{\partial x^2} + y\dfrac{\partial^2 u}{\partial x \partial y}$ is

(A) $(n-1)\dfrac{\partial u}{\partial x}$ (B) $n\dfrac{\partial u}{\partial x}$ (C) $(n-1)\dfrac{\partial u}{\partial y}$ (D) $n\dfrac{\partial u}{\partial y}$

58. The function $x^3 + y^3 - 3axy$ has a maximum or minimum at the point

(A) (a, a) (B) $(0, 0)$ (C) $(a, 0)$ (D) $(0, a)$

59. The value of the integral $\int_0^{\frac{\pi}{2}} \log \sin x \, dx$ is

(A) $-\pi \log 2$ (B) $\dfrac{-\pi}{2}\log 2$ (C) $\dfrac{\pi}{2}\log 2$ (D) $\pi \log 2$

60. The whole area of all the loops of the curve $r = a\cos 4\theta$ is

(A) $\dfrac{\pi a^2}{4}$ (B) $\dfrac{\pi a^2}{2}$ (C) πa^2 (D) $\dfrac{a^2}{2}$

61. The value of the integral $\int_1^2 \int_0^{y/2} y\,dy\,dx$ is

(A) $\dfrac{7}{24}$ (B) $\dfrac{7}{12}$ (C) $\dfrac{7}{6}$ (D) $\dfrac{1}{6}$

62. The value of $\Gamma(5/2)$ is

(A) $\dfrac{3\sqrt{\pi}}{4}$ (B) $\dfrac{15\sqrt{\pi}}{8}$ (C) $\dfrac{3\pi}{4}$ (D) $\dfrac{15\pi}{4}$

(Continued)

63. The order of the differential equation $\left\{1+\left(\frac{dy}{dx}\right)^2\right\}^{3/2}=\rho\frac{d^2y}{dx^2}$ is

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

64. The number of arbitary constants in the general solution of the differential equation $\left(\frac{d^3y}{dx^3}\right)^2+\sin x\left(\frac{dy}{dx}\right)^3+\log x\frac{dy}{dx}+9y=\cos x$ will be

(A) 2 (B) 3 (C) 5 (D) 6

65. The particular integral of the differential equation $(D^2+D-2)y=e^x$, where D denotes $\frac{d}{dx}$ is

(A) $\frac{1}{3}e^x$ (B) xe^x (C) $\frac{1}{3}xe^x$ (D) $\frac{1}{3}xe^{-x}$

66. Let the general solution of a differential equation be $y=ae^{bx+c}$, then order of the differential equation is

(A) 1 (B) 2

(C) 3 (D) Can not say

67. The solution of the differential equation $2x\frac{dy}{dx}-y=3$ represents a family of

(A) straight lines (B) circles (C) parabolas (D) ellipses

68. For $a, b, c \in R$, if the differential equation $(ax^2+bxy+y^2)dx+(2x^2+cxy+y^2)dy=0$ is exact, then

(A) $b=2, c=2a$ (B) $b=4, c=2$

(C) $b=2, c=4$ (D) $b=2, a=2c$

69. Let $y(x) = u(x)\sin x + v(x)\cos x$ be a solution of the differential equation $y'' + y = \sec x$, then $u(x)$ is

(A) $\ln|\cos x| + c$ (B) $-x + c$

(C) $x + c$ (D) $\ln|\cos x| - c$

70. An integrating factor of the differential equation $\frac{dy}{dx} = \frac{2xy^2 + y}{x - 2y^3}$ is

(A) $\frac{1}{y}$ (B) $\frac{1}{y^2}$ (C) y (D) y^2

71. y_1 and y_2 are two solutions of $y'' + ay' + by = 0$ then y_1 and y_2 linearly dependent, if

(A) $w(y_1, y_2) > 0$ (B) $w(y_1, y_2) < 0$

(C) $w(y_1, y_2) = 0$ (D) $w(y_1, y_2) = \infty$

72. $A\frac{\partial^2 u}{\partial x^2} + 2\frac{\partial^2 u}{\partial x \partial y} + B\frac{\partial^2 u}{\partial y^2} = 0$ is hyperbolic, if

(A) $A > 0, B > 0$ (B) $A < 0, B < 0$

(C) $A > 0, B < 0$ (D) $A = 0, B = 0$

73. The differential equation of all circles passing through the origin and having centre on the y-axis is

(A) $(x^2 + y^2)\frac{dy}{dx} = 2xy$

(B) $(x^2 - y^2)\frac{dy}{dx} = 2xy$

(C) $\frac{dy}{dx} = 2xy(x^2 + y^2)$

(D) $\frac{dy}{dx} = 2xy(x^2 - y^2)$

74. The solution of the differential equation $\frac{dy}{dx}+P(x)y=Q(x)$ is given by

(A) $y=e^{\int Pdx}\left\{\int Qe^{\int Pdx}dx+c\right\}$ (B) $y=e^{-\int Pdx}\left\{\int Qe^{-\int Pdx}dx+c\right\}$

(C) $y=e^{-\int Pdx}\left\{\int Qe^{\int Pdx}dx+c\right\}$ (D) $y=\int Qe^{\int Pdx}dx+c$

75. The external of the functional $\int_{1/2}^{1}x^2y'^2dx$ subject to the conditions $y\left(\frac{1}{2}\right)=1$, $y(1)=2$ is

(A) $y=\frac{-1}{x}$ (B) $y=-\frac{1}{x}+3$

(C) $y=-x+3$ (D) $y=-x^2+3$

76. The infinite series $1+\frac{1}{2^p}+\frac{1}{3^p}+\frac{1}{4^p}+\cdots$ is convergent, if

(A) $p<1$ (B) $p=1$ (C) $p\leq 1$ (D) $p>1$

77. If $f(x)=\begin{cases}1, \text{ when } x \text{ is rational}\\ -1, \text{ when } x \text{ is irrational}\end{cases}$, then $\int_a^b |f(x)|\,dx$ is equal to

(A) $-(b-a)$ (B) $(b-a)$ (C) 0 (D) $\frac{b-a}{2}$

78. Let $f:\mathbb{R}\to\mathbb{R}$ be a continuous function satisfying $x+\int_0^x f(t)dt=e^x-1$ for all $x\in\mathbb{R}$. Then the set $\{x\in\mathbb{R}:1\leq f(x)\leq 2\}$ is the interval

(A) [log2, log3] (B) [2log2, 3log3] (C) $[e-1, e^2-1]$ (D) $[0, e^2]$

 (Turn Over)

79. Let $\{x_n\}$ be a sequence of real numbers such that $\lim_{x\to\infty}(x_{n+1}-x_n)=c$, where c is a positive real numbers. Then the sequence $\left\{\frac{x_n}{n}\right\}$

(A) is NOT bounded
(B) is bounded but NOT convergent
(C) converges to c
(D) converges to 0

80. Let f be strictly monotonic continuous real valued function defined on $[a, b]$ such that $f(a) < a$ and $f(b) > b$. Then which one of the following is TRUE ?

(A) There exists exactly one $c \in (a, b)$ such that $f(c) = c$
(B) There exists exactly two points $c_1, c_2 \in (a, b)$ such that $f(c_i) = c_i$, $i = 1, 2$
(C) There exists no $c \in (a, b)$ such that $f(c) = c$
(D) There exist infinitely many points $c \in (a, b)$ such that $f(c) = c$

81. Let $\{a_n\}$ be a sequence of positive real number satisfying $\frac{4}{a_{n+1}} = \frac{3}{a_n} + \frac{a_n^3}{81}$, $n \geq 1$, $a_1 = 1$, then all the terms of the sequence lie in

(A) $\left[\frac{1}{2}, \frac{3}{2}\right]$
(B) $[0, 1]$
(C) $[1, 2]$
(D) $[1, 3]$

82. Let $f : [\mathbb{R} \to \infty)$ be a continuous function. Then which one of the following is NOT TRUE ?

(A) There exist $x \in \mathbb{R}$ such that $f(x) = \frac{f(0)+f(1)}{2}$
(B) There exist $x \in \mathbb{R}$ such that $f(x) = \sqrt{f(-1)f(1)}$
(C) There exist $x \in \mathbb{R}$ such that $f(x) = \int_{-1}^{1} f(t)dt$
(D) There exist $x \in \mathbb{R}$ such that $f(x) = \int_{0}^{1} f(t)dt$

(Continued)

83. Which one of the following is convex set ? for $x_1, x_2 \geq 0$

(A) $x_1^2 + x_2^2 = 1$

(B) $x_1^2 + x_2^2 \geq 1$

(C) $x_1^2 + x_2^2 \leq 1$

(D) $x_1 + x_2^2 \leq 1$

84. The number of basic solutions to the system $x_1 + 2x_2 + x_3 = 4,\ x_3 + x_4 = 1,$ $x_1 + x_3 + 2x_4 = 4$ is

(A) 6 (B) 4 (C) Infinite (D) 0

85. Which of the following is not correct ?

(A) In solving an LPP, every inequality constraint should be first replaced by a pair of equivalent equation.

(B) Successive solutions obtained in the simplex method always yield better and improved value of z.

(C) if a variable in an LPP is unrestricted, it may replaced by difference or two non-negative variables

(D) for each basic variables in an LPP we must have $(z_i - c_i) = 0$

86. The objective function $z = 4x + 3y$ will be miximized to the constraints $3x + 4y \leq 24,$ $8x + 6y \leq 48,\ x \leq 5,\ y \leq 6,\ x, y \geq 0$

(A) At only one point

(B) At two points only

(C) At an infinite number of points

(D) None of these

87. The constraints : $-x + y \leq 1, -x + y \leq 9, x \geq 0, y \geq 0$ define a or an

(A) Bounded feasible space

(B) Unbounded feasible space

(C) Bounded and infeasible space

(D) None of these

88. If the constraints in a LPP are changed, then

(A) The problem is to re-evaluated

(B) Solution not defined

(C) The objective of the function has to be modified

(D) The solution will remain same

89. Let X_1 and X_2 are optimal solutions of LPP then

(A) $X = \lambda X_1 + (1-\lambda)X_2$; $\lambda \in R$ is other optimal solution

(B) $X = \lambda X_1 + (1-\lambda)X_2$; $0 \le \lambda \le 1$, is an optimal solution

(C) $X = \lambda X_1 + (1+\lambda)X_2$; $0 \le \lambda \le 1$, is an optimal solution

(D) $X = \lambda X_1 + (1+\lambda)X_2$; $\lambda \in R$ is other optimal solution

90. Which method determines an initial basic feasible solution is close to the optimal solution.

(A) North-west corner method

(B) VAM or Penalty method

(C) Least-Cost method

(D) None of these

91. The number of distinct integral values of a satisfying the equation $2^{2a} + 3(2^{a+2}) + 2^5 = 0$ is

(A) 0

(B) 1

(C) 2

(D) Infinity

92. Consider the experiment of throwing two fair dice. What is the probability that the sum of the number obtained in these dice is even ?

(A) $\frac{1}{2}$

(B) $\frac{1}{4}$

(C) $\frac{1}{3}$

(D) $\frac{1}{6}$

93. Rolle's theorem can not be applied for the function $f(x) = |x+2|$ in $[-2, 0]$ because

(A) $f(x)$ is not continuous in $[-2, 0]$

(B) $f(x)$ is not differentiable $[-2, 0]$

(C) $f(-1) \neq f(-2)$

(D) None of these

94. What is the value of c of Cauchy's mean value theorem for $f(x) = e^x$ and $g(x) = e^{-x}$ in $[a, b]$?

(A) $\frac{a+b}{2}$ (B) $\sqrt{ab}$ (C) $\frac{2ab}{a+b}$ (D) $\frac{b-a}{2}$

95. A fair dice is rolled twice. The probability that odd number will follow an even number is

(A) $\frac{1}{2}$ (B) $\frac{1}{6}$ (C) $\frac{1}{3}$ (D) $\frac{1}{4}$

96. A letter is selected at random from the set of English alphabets and its is found to be a vowel. What is the probability that it is "e" ?

(A) $\frac{1}{2}$ (B) $\frac{1}{4}$ (C) $\frac{1}{5}$ (D) $\frac{1}{6}$

97. An urn A contains two white and three black balls and another urn B contains three white and four black balls. One urn is selected at random and a ball is drawn from it. If the ball drawn is found black, then the probability that the urn chosen was A is

(A) $\frac{13}{41}$ (B) $\frac{21}{41}$ (C) $\frac{23}{41}$ (D) $\frac{27}{41}$

98. Prasanta Speaks the truth four out of five times. A die is tossed. Prasanta reports that it is a 6. What are the chances that there are actually was a 6 ?

(A) $\frac{1}{9}$ (B) $\frac{2}{9}$ (C) $\frac{4}{9}$ (D) $\frac{5}{9}$

99. A random variable X has binomial distribution with $n = 10$ and $p = 0{\cdot}3$; then variance of X is

(A) 10 (B) 1.2 (C) 2.1 (D) None

(Turn Over)

100. Which of the following mentioned standard probability density function is applicable to discrete random variables ?

(A) Gaussian distribution

(B) Poisson distribution

(C) Rayleigh distribution

(D) Exponential distribution