Seat No.	

Total No. of Pages : 15

M.Sc Entrance Examination 2026

Mathematics

Sub. Code: 58716

Day and Date : Thursday,14-May-2026 **Total Marks : 100**

Time : 03.30 PM TO 05.00 PM

Instructions:

1) All questions are compulsory.
2) Each question carries 1 mark.
5) Choose the correct alternatives.

1. The general solution of differential equation $\sqrt{y-px}=p$ is ------------
    A) $y=cx+c$
    B) $y=cx-c^2$
    C) $y=cx+1$
    D) $y=cx+c^2$

2. The differential equation $y=2px+f(p^2x)$ can be reduced to Clairaut's form by standard substitution ---------------
    A) $x=u^2\ and\ y=v$
    B) $x=u^3\ and\ y=v^2$
    C) $x=u^3\ and\ y=e^v$
    D) $x=e^u\ and\ y=v$

3. The value of c in Lagrange's theorem for the function $f(x)=logsinx$ in the interval $\left[\frac{\pi}{6},\frac{5\pi}{6}\right]$ is ----------
    A) $\frac{\pi}{4}$
    B) $\frac{\pi}{2}$
    C) $\frac{2\pi}{3}$
    D) None of these

4. Expansion of $sinhx$ in ascending powers of x is --------
    A) $1+x+\frac{x^2}{2!}+\frac{x^3}{3!}+\frac{x^4}{4!}-----$
    B) $1+\frac{x^2}{2!}+\frac{x^4}{4!}+\frac{x^6}{6!}------$
    C) $x-\frac{x^3}{3!}+\frac{x^5}{5!}-\frac{x^7}{7!}------$
    D) $x+\frac{x^3}{3!}+\frac{x^5}{5!}+\frac{x^7}{7!}+-----$

5. The complete solution of the differential equation $(D^2 + 6D + 5)y = 0$ is --------

A) $y = c_1e^{-x} + c_2e^{-5x}$

B) $y = c_1e^{x} + c_2e^{-5x}$

C) $y = c_1e^{x} + c_2e^{5x}$

D) $y = c_1e^{-x} + c_2e^{5x}$

6. The degree of the homogeneous function $\frac{x+y}{\sqrt{x}+\sqrt{y}}$ is ---------

A) $\sqrt{2}$

B) 1

C) $\frac{-1}{2}$

D) $\frac{1}{2}$

7. If $x = r\cos\theta\,, y = r\sin\theta$ then $\frac{\partial^2\theta}{\partial x^2} + \frac{\partial^2\theta}{\partial y^2} = ---$

A) $tan\theta$

B) zero

C) $-r$

D) $\cos\theta$

8. If $u = e^x cosy, v = e^x siny$ then the Jacobian $\frac{\partial(u,v)}{\partial(x,y)}$ is --------

A) e^x

B) zero

C) one

D) $e^x sinycosx$

9. If $z = -1 + i$ then using De Moivre's theorem , $z^4 = -----$

A) -4

B) 4

C) $4i$

D) None of these

10. The function $f: A \to B$is called a one-one correspondence between A and B if --------

A) f is neither one-one nor onto

B) f is one-one and onto

C) f is one-one but not onto

D) f is not one-one but onto

11. The solution of the homogeneous differential equation

$x^2\frac{d^2y}{dx^2} - x\frac{dy}{dx} - 3y = 0$ is $y =$ ________.

A) $c_1x^3 + \frac{c_2}{x}$ B) $c_1x^3 + c_2x$ C) $c_1e^{3x} + c_2e^{-x}$ D) $c_1e^{-3x} + c_2x^3$

12. If a differential equation $\frac{d^2y}{dx^2} + P\frac{dy}{dx} + Qy = R$ and $P + xQ = 0$, then known solution is__________.

A) $y = e^{-x}$ B) $y = e^{x}$ C) $y = x^2$ D) $y = x$

13. If the condition of integrability is satisfied then the general solution of the differential equation $xdx + ydy + zdz = 0$ is ------------.

A) $x^2 + y^2 + z^2 = c$ B) $xyz = c$

C) $x^2y^2z^2 = c$ D) $x + y + z = c$

14. Let $y_0, y_1, \ldots, y_n$ be a set of values of $y = f(x)$. Then $\nabla^3 y_3$= ------------.

A) $y_3 - 3y_2 + 3y_1 - y_0$ B) $y_3 + 3y_2 + 3y_1 + y_0$

C) $y_3 - y_0$ D) $y_0 - 3y_1 + 3y_2 - y_1$

15. Consider the data:

X	0	1	2
F(x)	4	3	12

The value of $\int_0^2 f(x)\,dx$ by Trapezoidal rule is --------------.

A) 11 B) 12 C) 15 D) 9

16. The vector point function $\vec{f}$ is said to be solenoidal if ------------.

A) $curl\ \vec{f} = 0$ B) $div\ \vec{f} = 0$ C) $curl\ \vec{f} = 1$ D) $div\ \vec{f} = 1$

17. The value of $a.\nabla\left(\frac{1}{r}\right)$ =------------.

A) $-\frac{a.\bar{r}}{r^2}$ B) $\frac{a.\bar{r}}{r^2}$ C) $-\frac{a.\bar{r}}{r^3}$ D) $\frac{a.\bar{r}}{r^3}$

18. $\int_0^\infty e^{-x^2}dx$ =-----------.

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

19. $\beta\left(\frac{3}{2},\frac{3}{2}\right)$ =-----------.

A) $\frac{\pi}{4}$ B) $\frac{\pi}{8}$ C) $\frac{3\pi}{32}$ D) π

20. $erf(-x)$=----------.

A) $erf(x)$ B) $-erf(-x)$ C) $-erf(x)$ D) $erf_c(x)$

21. If $z = 3 + 4i$, then $|z|$ is …………

A) 3
B) 4
C) 5
D) 7

22. A function is analytic if it satisfies ....
    A) Only continuity
    B) Only differentiability
    C) Cauchy-Riemann equations
    D) None

23. A harmonic function satisfies ....
    A) Laplace equation
    B) Cauchy-Riemann equations
    C) Euler equation
    D) Conjugates

24. An analytic function with constant modulus is ....
    A) zero
    B) constant
    C) variable
    D) does not exist

25. The harmonic conjugate of $u(x, y) = x^3 - 3xy^2$ is ....
    A) $3x^2y - y^3 + x$
    B) $x^2y - 3y^3 + x$
    C) $3x^2y - y^3 + y$
    D) $3x^2y - y^3 + 5$

26. A continuous arc without multiple points is called a ....
    A) Jordan arc
    B) continuous arc
    C) contour
    D) rectifiable arc

27. If $f(z)$ is analytic in a simply connected domain, then ....
    A) $f(z)$ is constant
    B) $f(z)$ does not exist
    C) $\oint f(z)\, dz = 0$
    D) $\oint f(z)\, dz \neq 0$

28. If an entire function has a pole of order n at infinity, then it is ....

    A) constant function
    B) a polynomial of degree $n-1$
    C) a polynomial of degree n
    D) a polynomial of degree $n+1$

29. The value of the integral $\int_C \frac{dz}{z-7}$ where C is $|z| = 70$

    A) πi
    B) $2\pi i$
    C) $7\pi i$
    D) $\frac{\pi i}{7}$

30. Residue of $f(z)$ at $z = \infty$ is ....

    A) $2\pi i \int_C f(z)dz$
    B) $-2\pi i \int_C f(z)dz$
    C) $\frac{1}{2\pi i} \int_C f(z)dz$
    D) $-\frac{1}{2\pi i} \int_C f(z)dz$

31. $L\{e^{at}t^n\}$ is equal to :

    A) $\frac{n!}{(p+a)^n}$ B) $\frac{n!}{(p-a)^n}$ C) $\frac{n!}{(p+a)^{n+1}}$ D) $\frac{n!}{(p-a)^{n+1}}$

32. $L\{\sin\, at\} =$:

    A) $\frac{s}{s^2+a^2}$ B) $\frac{s^2}{s^2+a^2}$ C) $\frac{a^2}{s^2+a^2}$ D) $\frac{a}{s^2+a^2}$

33. $L\left\{\frac{d^2y(t)}{dt^2}\right\}$ is equal to:

    A) $p^2L\{y(t)\} - y(0) - y'(0)$ B) $p^2L'\{y(t)\} - py(0) + y'(0)$
    C) $pL\{y(t)\} - p^2y(0) - p^3y'(0)$ D) $pL\{y(t)\} - p^2y(0) + p^3y'(0)$

34. If $L\{F(t)\} = \{f(s)\}$ then $L\left\{\frac{F(t)}{t}\right\} =$:

    A) $\int_0^\infty f(x)dx$ B) $\int_1^\infty f(x)dx$ C) $\int_s^\infty f(x)dx$ D) $\int_{-\infty}^\infty f(x)dx$

35. $L^{-1}\left\{\frac{1}{s^3}\right\} =$

A) $\frac{t^2}{3!}$ B) $\frac{t^3}{4!}$ C) $\frac{t^3}{3!}$ D) $\frac{t^2}{2!}$

36. $L^{-1}\left\{\frac{2}{2p-1}\right\} =$ ___

A) e^{2t} B) $e^{\frac{t}{2}}$ C) e^{4t} D) $e^{\frac{t}{4}}$

37. The Inverse Laplace Transform of $\frac{\Gamma(k)}{p^k}$, $k > 0$ is :

A) x^k B) x^{k-1} C) x^{k+1} D) kx

38. $L^{-1}\{f(s-a)\} =$ _____, where $L\{f(t)\} = f(s)$

A) $e^{at}f(at)$ B) $e^{at}f(t)$ C) $e^{t}f(at)$ D) $e^{at}f(2t)$

39. Infinite Fourier transform of $F(x) = 1, |x| < k$

$= 0, |x| > k$

Where $F\{F(x)\} = \frac{1}{\sqrt{2\pi}}\int_{-\infty}^{\infty} F(x)e^{isx}dx$

A) $\sqrt{\frac{2}{\pi}}\frac{\cos sk}{s}$ B) $\sqrt{\frac{2}{\pi}}\frac{\tan sk}{s}$ C) $\sqrt{\frac{2}{\pi}}\frac{\sin sk}{s}$ D) $\sqrt{\frac{2}{\pi}}\frac{\sin sk}{k}$

40. Infinite inverse Fourier sin transform of e^{-as} over $0 < s < \infty$ is ...

where $F(x) = \sqrt{\frac{2}{\pi}}\int_0^{\infty} f_s(s).\sin sx ds$

A) $\sqrt{\frac{2}{\pi}}\cdot\frac{x}{(a^2+x^2)}$ B) $\sqrt{\frac{2}{\pi}}\cdot\frac{x}{(a^2-x^2)}$ C) $\sqrt{\frac{2}{\pi}}\cdot\frac{1}{(a^2+x^2)}$ D) $\sqrt{\frac{2}{\pi}}\cdot\frac{1}{(a^2-x^2)}$

41. If $\dim V = n$ and $\{w_1, w_2, \dots, w_r\}$ is a linearly independent subset of V then _______.

A) $r = n + 2$
B) $r \geq n$
C) $r \leq n$
D) $r = n + 1$

42. If W is a subspace of V, then $L(W) =$_______.

A) W
B) V
C) $\{0\}$
D) $\emptyset$

43. If $T: V \to U$ is a linear transformation then Ker T is a subspace of _______.

A) U
B) V
C) Range of T
D) $T(U)$

44. If $T: V \to W$ is a linear transformation such that rank of $T = 1$ and nullity of $T = 3$ then dim $V =$ _______.

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

45. If $T: V \to U$ is a homomorphism, then Ker $T = \{0\}$ iff _____________.

A) T is one - one
B) T is onto
C) T is neither one – one nor onto
D) T is both one – one and onto

46. The Cauchy-Schwarz inequality states that for any vectors $\boldsymbol{u}, \boldsymbol{v}$ in an inner product space V ___________.

A) $|\langle \boldsymbol{u}, \boldsymbol{v} \rangle| \leq \|\boldsymbol{u}\|\|\boldsymbol{v}\|$
B) $\|\boldsymbol{u} + \boldsymbol{v}\|^2 = \|\boldsymbol{u}\|^2 + \|\boldsymbol{v}\|^2$
C) $\|\boldsymbol{u} + \boldsymbol{v}\| \leq \|\boldsymbol{u}\| + \|\boldsymbol{v}\|$
D) $\|\boldsymbol{u} + \boldsymbol{v}\|^2 = \|\boldsymbol{u}\|^2 \cdot \|\boldsymbol{v}\|^2$

47. The norm of vector $\boldsymbol{u} = (0, 3, 0, 4)$ in the inner product space $\boldsymbol{R}^4$, with respect to Euclidean inner product is ______.

A) $\sqrt{7}$
B) $\sqrt{5}$
C) 5
D) 25

48. If $A = \begin{bmatrix} 2 & 2 \\ 0 & 3 \end{bmatrix}$, then the characteristic polynomial of matrix A is _______.

A) $x^2 + 5x - 6$
B) $x^2 - 5x + 6$
C) $x^2 - 6x + 5$
D) $x^2 - 5x - 6$

49. If the eigen values of a square matrix A are 3, –2, 2, then trace of A = ______.

A) 4
B) 17
C) –12
D) 3

50. If $T(1,\ 1) = (2,\ 2)$then _______ is an eigen value of T.

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

51. The statement that "If $< M, \rho >$is a complete metric space and if T is a contraction on M, then there is one and only one point $x \in M$ such that $T_x = x$ " is called ______.

A) Picard fixed point theorem
B) Nested Interval theorem
C) Picard contraction theorem
D) Picard completeness theorem

52. In a metric space $< M, \rho >$ with M = [0, 1] and ρ a usual metric defined by $\rho(x, y) = |x - y|$, the open ball $B\left[\frac{1}{4}; \frac{1}{2}\right] =$ _____.

A) $\left[-\frac{3}{4}, \frac{3}{4}\right]$
B) $\left(0, \frac{3}{4}\right)$
C) $\left[0, \frac{3}{4}\right)$
D) $\left(-\frac{3}{4}, \frac{3}{4}\right)$

53. The set $\bar{E}$ of all limit point of E is called the__________.

A) closure of E
B) open set
C) connected set
D) compact

54. Consider the two statements

I) Finite union of closed sets is closed.
II) Arbitrary union of open sets is open.
Then______.

A) only (I) true
B) only (II) true
C) both (I) and (II) are true
D) both (I) and (II) are false

55. Which of the following spaces are homeomorphic?
A) $(0,1)$ and $\mathbb{R}$
B) $[0,1]$ and $(0,1)$
C) $\mathbb{R}$ and $\mathbb{R}^2$
D) Finite and infinite set

56. The subset $A = [-2,2] \cup [4,5]$ of $\mathbb{R}^1$ is ___________.
A) closed and connected
B) neither open nor closed
C) connected but not closed
D) closed but not connected

57. A metric space is complete if ___________.
A) every sequence converges
B) every bounded sequence converges
C) every Cauchy sequence converges
D) every subsequence converges

58. A function is continuous if preimage of__________.
A) open sets is open
B) closed sets is open
C) points is open
D) open sets is closed

59. If M is connected metric space then_______.
A) M has a proper subset which is both open and closed
B) M has no proper subset which is both open and closed
C) M is not open
D) M is not closed

60. Which of the following is not a Cauchy sequence in a metric space R^1?
A) $\left\{\frac{n+4}{n}\right\}$
B) $\{n\}$
C) $\left\{\left(\frac{1}{2}\right)^n\right\}$
D) $\left\{\left(1+\frac{1}{n}\right)^n\right\}$

61. Let Q^* be the set of non-zero rational numbers and a binary operation $*$ on Q^* is defined as $a * b = \frac{ab}{2}$, then the identity of a group $< Q^*, * >$ is ___________.
A) 0
B) 1
C) 2
D) $\frac{1}{2}$

62. Which of the following group is not a subgroup of $< R, +>$?

A) $< Z, +>$, where z is a set of integers.
B) $< Q, +>$, where Q is a set of rational numbers.
C) $< R, +>$, where R is a set of real numbers.
D) $< C, +>$, where C is a set of complex numbers.

63. If G is an abelian group and $a \in G$, then the normalizer of a in G i.e., $N(a)$, is _______

A) G
B) $G - \{a\}$.
C) $\{a, a^{-1}\}$
D) $\{a\}$

64. Consider the following statements:
I) If H is a subset of a group G such that $o(H)$ divides $o(G)$, then H is a subgroup of G.
II) If H is a subgroup of a group G, then $o(H)$ divides $o(G)$.
Then____________.

A) Only I) is true.
B) Only II) is true
C) Both I) and II) are true
D) Both I) and II) are false

65. Consider a group $< Z, +>$ and $H = \{4n | n \in Z\}$, then index of H in Z is ________.

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

66. If $f: G \to G'$ is a group homomorphism with kernel K then _____________

A) $G \cong G'K$
B) $GK \cong G'$
C) $\frac{G}{K} \cong G'$
D) $G \cong \frac{G'}{K}$

67. A cycle of length 2 is called _______

A) even permutation
B) transposition
C) cyclic permutation
D) identity permutation

68. In a Boolean ring, each element is ________.

A) Unit
B) Nilpotent
C) Zero divisor
D) Idempotent

69. The multiplication in a ring $R_1 \times R_2$ is defined as __________.

A) $(a,b)(c,d) = (ac + bd, ad + bc)$
B) $(a,b)(c,d) = (ac, bd)$
C) $(a,b)(c,d) = (ad, bc)$
D) $(a,b)(c,d) = (ac + bd, ad - bc)$

70. Which of the following is a smallest ideal of a ring R containing both ideals I_1 and I_2?

A) $I_1 \cup I_2$
B) $I_1 \cap I_2$
C) $I_1 + I_2$
D) $I_1 I_2$

71. Initial Basic feasible solution of LPP is obtained by assuming the values of ______variables equal to zero.

A) Basic
B) Non-basic
C) Slack
D) Surplus

72. In the optimal simplex table, $z_j - c_j = 0$ for a non-basic variable indicates _____.

A) unbounded solution
B) cycling
C) alternative solution
D) infeasible solution

73. If a linear programming problem has the objective function $Max\ Z = 3x_1 + 2x_2$ with constraints $x_1 - x_2 > 1$ and $x_1 + x_2 > 3$ then the LPP has __________.

A) infinite solutions
B) unique solutions
C) no solutions
D) unbounded solution

74. In Big-M method, where M is very big number is the cost of___________.

A) Slack variables
B) Surplus variables
C) Basic variables
D) Artificial variables

75. If at least one artificial variable appears in the basis at positive level and the optimality condition is satisfied then the original problem has_________.

A) No feasible solution
B) No solution
C) Feasible solution
D) None of these

76. Maximization assignment problem is transformed into minimization problem by

A) adding each entry in a column from the maximum value in that column
B) Subtracting each entry in a column from the maximum value in that column
C) subtracting each entry in the table from the maximum value in table
D) none of the above

77. If there are 5 workers and 5 jobs in assignment problem then there would be
A) 9 solutions
B) 16 solutions
C) 24 solutions
D) 120 solutions

78. Consider the following statements.
Statement I: A feasible solution must satisfy all constraints.
Statement II: A feasible solution must satisfy non-negativity restrictions.
A) Both statements are true
B) Both statements are false
C) Only Statement I is true
D) Only Statement II is true

79. Operation research approach is _____
A) Multi-disciplinary
B) Scientific
C) Intuitive
D) All of these

80. In Hungarian method, we draw straight lines to cover all the zeros on_____
A) Marked rows and Unmarked columns
B) Marked rows and Marked columns
C) Marked Columns and Unmarked rows
D) Unmarked rows and Unmarked columns

81. Let $f: \mathbb{R} \rightarrow \mathbb{R}$ defined by $f(x) = x^2$. Then f is
A) One-one and onto
B) One-one but not onto
C)Onto but not one-one
D)Neither one-one nor onto

82. The set of all rational numbers $\mathbb{Q}$ is
A)Finite B)Countable C)Uncountable D)Empty

83. Every bounded monotone sequence is
A)Divergent B)Oscillatory C)Convergent D)Unbounded

84. The sequence $a_n = (-1)^n$ is
A)Convergent B)Divergent C)Cauchy D)Monotone

85. A sequence (a_n) is Cauchy if
A) It is bounded
B) It converges
C) Terms become arbitrarily close
D) It is monotone

86. The limit superior of the sequence $(-1)^n$ is
A) 0 B)1 C) -1 D)Does not exist

87. If $\sum a_n$ converges absolutely, then it is
A)Divergent B)Conditionally convergent C)Convergent D)Oscillatory

88. The series $\sum(-1)^{n+1}\frac{1}{n}$ is
A)Absolutely convergent B)Finite
C)Divergent D)Conditionally convergent

89. The least upper bound of the set $(0,1)$ is
A) 0 B) 1 C) Does not exist D) ∞

90. A subsequence of a convergent sequence
A) Always converges to same limit B) Need not converge
C) Always diverges D) Is unbounded

91. The partial differential equation of the form $Pp + Qq = R$, where P, Q, R are functions of x, y and z is called . . .
A) Charpit's partial differential equation.
B) Jacobi's partial differential equation.
C) Lagrange's partial differential equation.
D) Pfaffian partial differential equation.

92. The general solution of the partial differential equation $z = ax + 3a^2y + c$ is . . .
A) $q = 3p^2$
B) $p = 3q$
C) $p = 3q^2$
D) $q = 3p$

93. The partial differential equation obtained by eliminating arbitrary constants from $z = (x + a)(y + b)$ is . . .
A) $z = p + q$
B) $z = pq$
C) $z = p - q$
D) $z = \frac{p}{q}$

94. A partial differential equation, by eliminating arbitrary function f from $z = f(x^2 - y^2)$ is . . .
A) $xp + yq = 0$
B) $x^2p + y^2q = 0$
C) $y^2p + x^2q = 0$
D) $yp + xq = 0$

95. A general solution of the partial differential equation $z = xp + yq$ is . . .

A) $f\left(\frac{x}{y}, \frac{y}{z}\right) = 0$

B) $f(xy, yz) = 0$

C) $f(x - y, y - z) = 0$

D) $f(x^2, y^2) = 0$

96. A particular integral of the partial differential equation $(D^2 - 2DD' + D'^2)z = e^{x+2y}$ is . . .

A) $2e^{x+2y}$

B) $\frac{1}{20}e^{x+2y}$

C) e^{x+2y}

D) $\frac{1}{2}e^{x+2y}$

97. A solution of the partial differential equation $(D^2 - D'^2 + D - D')z = 0$ is . . .

A) $z = f_1(y + x) + e^{-x}f_2(y - x)$

B) $z = f_1(y + x) + e^{x}f_2(y - x)$

C) $z = f_1(y - x) + e^{-x}f_2(y - x)$

D) $z = f_1(y - x) + e^{x}f_2(y - x)$

98. A complete integral of the partial differential equation $z = p + q$ is . . .

A) $\log z = ax + \frac{a}{1+a}y + c$

B) $\log z = \frac{1}{1+a}x + \frac{a}{1+a}y + c$

C) $z = \frac{1}{1+a}x + \frac{a}{1+a}y + c$

D) $z = ax + \frac{a}{1+a}y + c$

99. A complete integral of the partial differential equation $z = px + qy - p^2q$ is . . .

A) $z = ax + by - a^2b$

B) $\log z = ax + by - a^2b$

C) $z = ax + by + a^2b$

D) $\log z = ax + by + a^2b$

100 The particular integral (P.I.) of $(D^2 + DD' - 6D'^2)z = \sin(x + 2y)$ is . . ..

A) $-\frac{1}{15}\sin(x + 2y)$

B) $\frac{1}{21}\sin(x + 2y)$

C) $\frac{1}{15}\cos(x + 2y)$

D) $-\frac{1}{21}\cos(x + 2y)$

♦♦♦

ROUGH WORK