

Seat No.

Total No. of Pages : 14

RE-Entrance Examination 2026
Department of Mathematics
M.Sc. Mathematics (Mathematics with Computer Science)
Subject Code : 58716

Day and Date : Wednesday, 24-06-2026

Total Marks : 100

Time : 12:30 pm to 02.00 pm

Instructions:

- 1) All questions are compulsory.
- 2) Each question carries 1 mark.
- 3) Answers should be marked in the given OMR answer sheet by darkening the appropriate option.
- 4) Follow the instructions given on OMR sheet.
- 5) Rough work shall be done on the sheet provided at the end of question paper.

1. A polynomial function in \mathbb{R} -----
 - A) is never continuous in \mathbb{R}
 - B) is always continuous in \mathbb{R}
 - C) may or may not be continuous in \mathbb{R}
 - D) is continuous in \mathbb{R} except at $x=0$

2. The necessary and sufficient condition for $Mdx + Ndy = 0$ to be exact is -----
 - A) $\frac{\partial M}{\partial x} = \frac{\partial N}{\partial y}$
 - B) $\frac{\partial^2 M}{\partial x^2} + \frac{\partial^2 N}{\partial y^2}$
 - C) $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$
 - D) $\frac{\partial^2 M}{\partial x \partial y}$

3. The general solution of differential equation $\frac{dy}{dx} + yx^{-1} = \frac{1}{x}$ is -----
 - A) $xy = x^2 + c$
 - B) $y = 1 + cx^{-1}$
 - C) $xy = 1 + c$
 - D) $y = x + c$

4. If $u = \sin(x^2y^2)$ then $(\frac{\partial z}{\partial x})^2 + (\frac{\partial z}{\partial y})^2 =$ -----
 - A) $4x^2y^2 \cos^2(x^2y^2)$
 - B) $4x^2y^2(x^2 + y^2)$
 - C) $4x^2y^2(x^2 + y^2) \cos^2(x^2y^2)$
 - D) None of these

5. If $u = x^2 + 2y^2 + 3z^2$ where $x = e^t, y = e^{2t}, z = e^{3t}$ then $\frac{du}{dt}$ at $t = 0$ is -----
 - A) 4
 - B) 10
 - C) 28
 - D) zero

6. If $z = \frac{xy}{x+y}$ then $x \frac{\partial z}{\partial x} + y \frac{\partial z}{\partial y} = \text{-----}$
 A) z
 B) zero
 C) $2z$
 D) z^2
7. Using DeMoivre's theorem, $\frac{(1+i\sqrt{3})^6}{(1-i\sqrt{3})^6} = \text{-----}$
 A) e^{-i}
 B) $e^{i4\pi}$
 C) $e^{\frac{i\pi}{2}}$
 D) $e^{\frac{i3\pi}{2}}$
8. The value of $\log \left(\frac{x+iy}{x-iy} \right) = \text{-----}$
 A) $2\sqrt{x^2 + y^2}$
 B) $2\log\sqrt{x^2 + y^2}$
 C) $2i \tan^{-1} \left(\frac{y}{x} \right)$
 D) $2 \tan^{-1} \left(\frac{y}{x} \right)$
9. Expansion of $\tan^{-1} x$ in ascending powers of x is -----
 A) $x + \frac{x^3}{3!} + \frac{x^5}{5!} + \text{-----}$
 B) $x - \frac{x^3}{3!} + \frac{x^5}{5!} - \text{-----}$
 C) $x - \frac{x^3}{3} + \frac{x^5}{5} - \text{-----}$
 D) $x + \frac{x^3}{3} + \frac{x^5}{5} + \text{-----}$
10. Continuity is ----- condition for the existence of derivative
 A) necessary but not sufficient
 B) sufficient but not necessary
 C) necessary as well as sufficient
 D) neither sufficient nor necessary
11. If we put $z = \log x$ in a homogeneous linear differential equation, then the value of $x^2 \frac{d^2y}{dx^2}$ is
 A) $z^2 \frac{d^2y}{dz^2}$ B) $z^2 \frac{d^2y}{dz^2} - z \frac{dy}{dz}$ C) $\frac{d^2y}{dz^2} - \frac{dy}{dz}$ D) $\frac{d^2y}{dz^2} + \frac{dy}{dz}$
12. If the differential equation $\frac{d^2y}{dx^2} + P \frac{dy}{dx} + Qy = R$ reduces to $\frac{d^2v}{dx^2} + Q_1v = R_1$ by changing the dependent variable y to v then $Q_1 = \text{-----}$.
 A) $Q - \frac{1}{2}P^2 - \frac{1}{4} \frac{dP}{dx}$ B) $Q - \frac{1}{4}P^2 - \frac{1}{2} \frac{dP}{dx}$
 C) $1 + P + Q$ D) $Q + \frac{1}{4}P^2 + \frac{1}{2} \frac{dP}{dx}$

24. Polar form of Cauchy Riemann equations are
- A) $\frac{\partial u}{\partial r} = \frac{1}{r} \frac{\partial v}{\partial \theta}, \frac{\partial v}{\partial r} = \frac{1}{r} \frac{\partial u}{\partial \theta}$
 B) $\frac{\partial u}{\partial r} = \frac{1}{r} \frac{\partial v}{\partial \theta}, \frac{\partial v}{\partial r} = -\frac{1}{r} \frac{\partial u}{\partial \theta}$
 C) $\frac{\partial u}{\partial \theta} = \frac{1}{r} \frac{\partial v}{\partial r}, \frac{\partial v}{\partial \theta} = \frac{1}{r} \frac{\partial u}{\partial r}$
 D) $\frac{\partial u}{\partial \theta} = \frac{1}{r} \frac{\partial v}{\partial r}, \frac{\partial v}{\partial \theta} = -\frac{1}{r} \frac{\partial u}{\partial r}$
25. Which of the following is not entire function?
- A) $f(z) = e^z$
 B) $f(z) = \sin z$
 C) $f(z) = |z|^2$
 D) $f(z) = z^3 + 3z + 5$
26. The value of integral $\int_0^{1+i} z \, dz$ is
- A) 0
 B) i
 C) $1 + i$
 D) $(1 + i)^2$
27. Which of the following is the correct Cauchy integral formula?
- A) $f(a) = 2\pi i \oint \frac{f(z)}{z+a} \, dz$
 B) $f(a) = 2\pi i \oint \frac{f(z)}{z-a} \, dz$
 C) $f(a) = \frac{1}{2\pi i} \oint \frac{f(z)}{z+a} \, dz$
 D) $f(a) = \frac{1}{2\pi i} \oint \frac{f(z)}{z-a} \, dz$
28. Infinite principal part of the Laurent series implies
- A) pole
 B) essential singularity
 C) removable singularity
 D) All of the above
29. The function $f(z) = \frac{\sin z}{z^2(z-2)}$ has a pole $z = 0$ of order
- A) 0
 B) 1
 C) 2
 D) 3
30. The value of the integral $\int_C \frac{dz}{z^2-3z+2}$ where C is $|z-1| = 2$ is
- A) 0
 B) πi
 C) $2\pi i$
 D) $-2\pi i$

31. $L[5t - a] = :$
 A) $\frac{5-as}{s^2}$ B) $\frac{as-5}{2s}$ C) $\frac{5-as}{s}$ D) $\frac{5+as}{s}$
32. $L\{\sin t\} = :$
 A) $\frac{s}{s^2+1}$ B) $\frac{s^2}{s^2+1}$ C) $\frac{1}{s^2+1}$ D) $\frac{1}{s^2+1}$
33. Laplace transform of Heaviside's unit step function $H\{t\}$ is _____.
 A) $\frac{e^{-as}}{s}$ B) $\frac{e^{as}}{s}$ C) $\frac{1}{s}$ D) $\frac{1}{a}$
34. If $L\{F(t)\} = f(p)$, then $L\{F(at)\} = \underline{\hspace{2cm}}$.
 A) $\frac{a^n}{ap^n} f(p)$ B) $\frac{1}{a} f(p)$ C) $\frac{1}{a} f\left(\frac{p}{a}\right)$ D) $\frac{d}{dp} f(p)$
35. $L^{-1}\left\{\frac{1}{(s-3)^2}\right\} = \underline{\hspace{2cm}}$
 A) $e^{2t} \cdot t$ B) $e^{3t} \cdot t$ C) $e^{3t} \cdot t^2$ D) $e^t \cdot t$
36. $L^{-1}\left\{\frac{1}{s^2 + 2s + 10}\right\} = \underline{\hspace{2cm}}$
 A) $2e^{-t} \sin 3t$ B) $\frac{1}{3} e^{-t} \sin 3t$ C) $\frac{1}{2} e^{-t} \sin t$ D) $e^{-3t} \sin 3t$
37. If $L^{-1}\{f(s)\} = F(t)$ then $L^{-1}\{f^{(n)}(s)\} = \underline{\hspace{2cm}}$.
 A) $t^n F(t)$ B) $(-1)^n F(t)$ C) $(-1)^n t^n F(t)$ D) $(-1)^{n-1} t^n F(t)$
38. If $f(s)$ is Fourier transform of $F(x)$ then Fourier transform of $F(x) \cdot \cos ax$ is
 A) $\frac{1}{2}[f(s-a) - f(s+a)]$ B) $\frac{1}{2}[f(s-a) + f(s+a)]$
 C) $\frac{1}{2}[f(s) + f(s+a)]$ D) $\frac{1}{2}[f(s-a) + f(s)]$
39. If $f(s)$ is Fourier transform of $f(x)$ then is Fourier transform of $f'(x)$.
 A) $sf(s)$ B) $s^2 f(s)$ C) $isf(s)$ D) $is^2 f(s)$
40. If $f(s)$ is Fourier transform of $f(x)$ then $\frac{1}{a} f\left(\frac{s}{a}\right)$ is Fourier transform of ____
 A) $f(x)$ B) $f(ax)$ C) $f\left(\frac{x}{a}\right)$ D) $af(x)$

41. Consider the following statements:
 Statement (i) The subset $A = \{(x, y, 1) : x, y \in \mathbb{R}\}$ of \mathbb{R}^3 is a subspace of \mathbb{R}^3 .
 Statement (ii) The subset $B = \{(x, y, z) \in \mathbb{R}^3 : x + y + z = 0\}$ is a subspace of \mathbb{R}^3 .
 Then _____.
 A) Only statement (ii) is true
 B) Only statement (i) is true
 C) Both the statements are false
 D) Both the statements are true
42. If $T: U \rightarrow V$ is a linear transformation such that $\dim U = 5$ and nullity of $T = 3$ then rank of $T =$ _____.
 A) 8
 B) 2
 C) 3
 D) 15
43. If $T: V \rightarrow W$ is a linear transformation, the rank of T is defined as the _____.
 A) number of vectors in $\text{Ker}T$
 B) number of vectors in $\text{Range } T$
 C) dimension of $\text{Ker}T$
 D) dimension of $\text{Range } T$
44. A linear transformation $T: V \rightarrow W$ is non singular if _____.
 A) T is not one- one
 B) $\text{Ker } T = \{0\}$
 C) T is not onto
 D) $\text{Range } T = \{0\}$
45. Inner product space over the field of complex numbers is called _____.
 A) Unitary space
 B) Euclidean space
 C) Real space
 D) Dual space
46. If V is an inner product space and $x, y \in V$ are orthogonal vectors, then $\|x + y\|^2 =$ _____.
 A) $2(\|x\|^2 + \|y\|^2)$
 B) $\|x\|^2 - \|y\|^2$
 C) $2(\|x\|^2 - \|y\|^2)$
 D) $\|x\|^2 + \|y\|^2$
47. If $A = \begin{bmatrix} 4 & 1 \\ 0 & 5 \end{bmatrix}$, then characteristic polynomial of matrix A is _____.
 A) $x^2 + 6x - 20$
 B) $x^2 - 20x + 9$
 C) $x^2 - 9x + 20$
 D) $x^2 + 9x + 20$

48. The norm of vector $(4, 2, 2, -6)$ with respect to Euclidean inner product is _____.
- $2\sqrt{15}$
 - 60
 - 14
 - $4\sqrt{15}$
49. If T is a linear operator on vector space V . If $\exists 0 \neq v \in V$ such that $T(v) = cv$, for some $c \in F$, then c is called _____.
- an Eigen vector of T
 - an Eigen value of T
 - the Rank of T
 - the Nullity of T
50. If the characteristic polynomial of a matrix A is $x^2 + 1$, then the trace of $A =$ _____.
- 1
 - 3
 - 1
 - 0
51. Consider the following statements.
- Every convergent sequence in any metric space is a Cauchy sequence.
 - Every Cauchy sequence in any metric space is a convergent sequence. Then _____.
- Only I) is true
 - Only II) is true
 - Both I) and II) are true
 - Both I) and II) are false
52. If $f : \mathbb{R}^1 \rightarrow \mathbb{R}^1$ defined by $f(x) = x - 1$, then the inverse image of the open set $(0,1)$ is _____.
- $[1, 2]$
 - $[1, 2)$
 - $(1, 2]$
 - $(1, 2)$
53. If $A = (0, \infty) \subset \mathbb{R}_d$ (discrete metric space), then $\text{diam}(A) =$ _____.
- 0
 - 1
 - ∞
 - c , where $c \in (1, \infty)$.
54. Which of the following condition is satisfied by a contraction operator T on a metric space M ?
- $\rho(Tx, Ty) \leq \frac{5}{4}\rho(x, y) \quad \forall x, y \in M$
 - $\rho(Tx, Ty) \leq \rho(x, y) \quad \forall x, y \in M$
 - $\rho(Tx, Ty) \leq \frac{1}{4}\rho(x, y) \quad \forall x, y \in M$
 - $\rho(Tx, Ty) = \rho(x, y) \quad \forall x, y \in M$

55. The metric space $[a, b]$ with absolute value metric is _____.
- complete but not totally bounded
 - both complete and totally bounded
 - totally bounded but not complete
 - neither complete nor totally bounded
56. A function f from a set A into a metric space M is bounded if _____.
- $f(A)$ is bounded subset of M
 - A is bounded subset of M
 - $f(A)$ is closed subset of M
 - A is closed subset of M
57. A metric space is compact if _____.
- every sequence converges
 - every open cover has finite sub cover
 - every set is closed
 - every sequence is Cauchy
58. In a metric space $\langle M, \rho \rangle$ with $M = (0, 1)$ and ρ a usual metric defined by $\rho(x, y) = |x - y|$, the open ball $B\left[0; \frac{1}{2}\right] =$ _____.
- $\left[-\frac{1}{2}, \frac{1}{2}\right]$
 - $\left(0, \frac{1}{2}\right)$
 - $\left[0, \frac{1}{2}\right)$
 - $\left(-\frac{1}{2}, \frac{1}{2}\right)$
59. Which is complete metric space?
- $(0, 1)$
 - open set
 - \mathbb{Q}
 - \mathbb{R}
60. If M is connected metric space then _____.
- M has a proper subset which is both open and closed
 - M has no proper subset which is both open and closed
 - M is not open
 - M is not closed
61. Which of the following group is not commutative?
- Set of real numbers with addition
 - Set of complex numbers with multiplication
 - Set of 2×2 invertible real matrices with matrix multiplication
 - Set of non zero rational numbers with multiplication.
62. In a group Z_7 with addition modulo 7, $4 \oplus_7 6 =$ _____.
- 10
 - 2
 - 4
 - 3

63. In a group , the set $\{x \in G \mid xg = gx, \forall g \in G\}$ is called _____.
- A normal subgroup of G
 - A cyclic subgroup of G
 - Centre of a group G
 - Normalize of a group G
64. Let H be any subgroup of a commutative group G , then _____.
- $Ha = aH, \forall a \in G$
 - $Ha \subset aH, \forall a \in G$
 - $Ha \supset aH, \forall a \in G$
 - $Ha \neq aH, \forall a \in G$
65. The set of generators of an infinite cyclic group $\langle Z, + \rangle$ is _____.
- $\{1\}$
 - $\{-1\}$
 - $\{0, 1, -1\}$
 - $\{1, -1\}$
66. If $\phi(12) = \underline{\hspace{2cm}}$, where ϕ is an Euler's phi function.
- 2
 - 4
 - 6
 - 11
67. If $f: G \rightarrow G'$ is a one-one homomorphism, then f is called _____.
- monomorphism
 - isomorphism
 - epimorphism
 - automorphism
68. Which of the following is a subring of Z ?
- N
 - $2Z$
 - ring of odd integers
 - ring of Prime numbers
69. If an element $a \in R$ is both idempotent and nilpotent, then _____.
- $a = 0$
 - $a = 1$
 - $a = -1$
 - a can be any element
70. Smallest ideal in any ring R is _____.
- R
 - $\{1\}$
 - $\{0\}$
 - $R - \{0\}$
71. Degenerate solution of a LPP means _____.
- all non-basic variables are positive
 - all basic variables are positive
 - all basic variables are negative
 - one or more basic variables are zero

72. An assignment problem is considered as a particular case of a transportation problem because _____
- A) the number of rows equals columns
 - B) all $X_{ij} = 0$ or 1
 - C) all rim conditions are 1
 - D) all of the above
73. Variable not in basic variable column of simplex table is _____
- A) never equal to zero
 - B) always equal to zero
 - C) called a basic variable
 - D) none of the above
74. A variable used to convert \leq inequality to equation is called as _____
- A) surplus
 - B) slack
 - C) Artificial
 - D) basic
75. If the feasible region of a LPP is empty, then the problem has _____ solution.
- A) unbounded
 - B) unique
 - C) infinite
 - D) no feasible
76. A LPP with constraints $2x_1 + x_2 \geq 2$ and $x_1 + x_2 = 2$ has _____
- A) no feasible
 - B) infinite number of feasible solutions
 - C) only one feasible solution
 - D) none of these
77. Consider the following statements for a LPP.
Statement I: Every optimal solution is a basic feasible solution.
Statement II: Every basic feasible solution is optimal.
- A) Both statements are true
 - B) Both statements are false
 - C) Only Statement I is true
 - D) Only Statement II is true
78. Non-negativity condition is an important component of LP model because
- A) variables value should remain under the control of the decision-maker
 - B) value of variables make sense and correspond to real-world problems
 - C) variables are interrelated in terms of limited resources
 - D) none of the above
79. In standard form of L.P.P constant on right hand side of each constraint must be _____
- A) non- positive
 - B) positive
 - C) negative
 - D) non-negative

80. While solving an assignment problem, an activity is assigned to a resource through a square with zero opportunity cost because the objective is to _____
 A) minimize total cost of assignment
 B) reduce the cost of assignment to zero
 C) reduce the cost of that particular assignment to zero
 D) none of the above
81. If $f: A \rightarrow B$ and $g: B \rightarrow C$ are one-one, then $g \circ f$ is _____
 A) Onto B) invertible C) Constant D) One-one
82. The set of irrational numbers is _____
 A) Countable B) Finite C) Uncountable D) Empty
83. Every non-empty bounded above subset of \mathbb{R} has _____
 A) Maximum B) Minimum C) Supremum D) Infimum
84. If (a_n) is bounded and increasing, then it _____
 A) Diverges B) Converges C) Oscillates D) Is unbounded
85. If $\lim a_n = L$, then $\lim |a_n| =$ _____
 A) L B) $|L|$ C) $-L$ D) Does not exist
86. A necessary condition for convergence of $\sum a_n$ is _____
 A) $a_n \rightarrow 0$ B) a_n bounded C) a_n increasing D) a_n decreasing
87. If $\lim \sup a_n = \lim \inf a_n$, then sequence is _____
 A) Divergent B) Convergent C) Oscillatory D) Unbounded
88. If $\sum a_n$ and $\sum b_n$ converge, then $\sum (a_n + b_n)$ _____
 A) Diverges B) Converges C) Oscillates D) Not defined
89. The series $\sum \frac{1}{n^2}$ is _____
 A) Divergent B) Conditionally convergent
 C) Absolutely convergent D) Oscillatory
90. The sequence $a_n = \frac{1}{n}$ is _____
 A) Divergent B) Convergent to 1 C) Convergent to 0 D) Oscillatory

91. A complete integral of $p^2 = zq$ is ...
- $z = be^{ax}$
 - $z = be^{a^2y}$
 - $z = be^{a(x+y)}$
 - $z = be^{ax+a^2y}$
92. A partial differential equation, by eliminating arbitrary constant a, b from $z = a(x + y) + b$ is ...
- $p + q = 0$
 - $pq = 1$
 - $q = p$
 - $p + q = 1$
93. A partial differential equation, by eliminating arbitrary function f from $z = f\left(\frac{y}{x}\right)$ is ...
- $xp - yq = 0$
 - $xp + yq = 0$
 - $y^2p + x^2q = 0$
 - $y^2p - x^2q = 0$
94. A general solution of the partial differential equation $p + q = 1$ is ...
- $z = ax + (1 - a)y + c$
 - $z = x + y + c$
 - $z = ax + ay + c$
 - $z = \phi(x + y)$
95. The particular integral of $(D^2 - D'^2)z = \sin(x - y)$ is ...
- $\frac{x}{2} \cos(x - y)$
 - $-\frac{x}{2} \cos(x - y)$
 - $\frac{1}{2} \sin(x - y)$
 - Fails to exist
96. A solution of the partial differential equation $DD'(D - 3D' - 3)z = 0$ is ...
- $z = f_1(y) + f_2(x) + e^{3x}f_3(y - 3x)$
 - $z = f_1(y) + f_2(x) + e^{-3x}f_3(y - 3x)$
 - $z = f_1(y) + f_2(x) + e^{3x}f_3(y + 3x)$
 - $z = f_1(y) + f_2(x) + e^{-3x}f_3(y + 3x)$

97. A complete integral of the partial differential equation $p = e^q$ is . . .
- A) $z = ax + e^a y + b$
 B) $z = ax + (\sqrt{1 - a^2})y + b$
 C) $z = \frac{a}{a-1}x + ay + c$
 D) $z = ax + \log(a)y + c$
98. A complete integral of the partial differential equation $p(1 + q) = qz$ is . . .
- A) $z = be^{x+ay}$
 B) $\log z = be^{x+ay}$
 C) $az - 1 = be^{x+ay}$
 D) $az = ax + by$
99. A complete integral of the partial differential equation $z = px + qy + pq$ is . . .
- A) $z = ax + ay + a^2$
 B) $z = ax + ay + ab$
 C) $\log z = ax + ay + ab$
 D) $\log z = ax + ay + a^2$
100. The complementary function (C.F.) of the partial differential equation $\frac{\partial^2 z}{\partial x^2} - 5 \frac{\partial^2 z}{\partial x \partial y} + 6 \frac{\partial^2 z}{\partial y^2} = 0$ is:
- A) $\phi_1(y + 2x) + \phi_2(y + 3x)$
 B) $\phi_1(y - 2x) + \phi_2(y - 3x)$
 C) $\phi_1(y + 2x) + \phi_2(y - 3x)$
 D) $\phi_1(y - 2x) + \phi_2(y + 3x)$



ROUGH WORK