



VINAYAKA MISSION'S RESEARCH FOUNDATION, SALEM
(Deemed to be University under section 3 of the UGC Act 1956)

Ph.D Entrance Test – November – 2025

Faculty of Arts & Sciences / Mathematics

Instructions / Note:

1. Answer all the questions. Each question carries one mark.
2. No negative marks for wrong answers.
3. Read each question carefully and answer in the OMR sheet provided for each question with only blue/ black pen to fill the circles in the OMR Sheet.
4. Question number 1 - 35 questions belong to Research Methodology component and Question number 36-70 questions belong to the subject at PG level
5. Return the question paper along with the OMR sheet.

36. Any two finite-dimensional vector spaces over F of the same dimension are _____
- A. Automorphic
 - B. Cyclic group
 - C. Field
 - D. Isomorphic
37. Let I be an ideal of the ring R . Determine which of the following statement is true?
- A. R is a ring with identity $\Rightarrow \frac{R}{I}$ is a ring with identity
 - B. R is an integral domain $\Rightarrow \frac{R}{I}$ is an integral domain
 - C. $\frac{R}{I}$ is an integral domain $\Rightarrow R$ is an integral domain
 - D. R is a field $\Rightarrow \frac{R}{I}$ is a field
38. A subgroup N of G is a normal subgroup of G if and only if the product of two right cosets of N in G is a coset of N in G .
- A. Left
 - B. Right
 - C. Both right and left
 - D. Neither right nor left
39. The sum of the squares of the eigen value of $\begin{pmatrix} 1 & 7 & 5 \\ 0 & 2 & 9 \\ 0 & 0 & 5 \end{pmatrix}$, _____
- A. 32
 - B. 30
 - C. 28
 - D. 34



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40. If A and B are Hermitian matrices such that $A^2 + B^2 = 0$ then _____

- A. $B^2 = -A^2$
- B. $B = iA$
- C. $A = 0$ and $B = 0$
- D. $A + iB = A - iB$

41. The sequence $1, -1, 1, -1, \dots$ is _____

- A. Monotonic increasing and is bounded
- B. Monotonic decreasing and is bounded
- C. Not monotonic and is not bounded
- D. Not monotonic and is bounded

42. The sequence $\langle (-1)^n \rangle$ is _____

- A. Bounded
- B. Not bounded
- C. Convergent
- D. Divergent

43. The sum of the series $1 \cdot 2 \cdot 3 + 2 \cdot 3 \cdot 4 + 3 \cdot 4 \cdot 5 + \dots$ to n terms is _____

- A. $\frac{1}{4}n(n+1)$
- B. $\frac{1}{4}n(n+1)(n+2)$
- C. $\frac{1}{4}n(n+1)(n+2)(n+3)$
- D. $\frac{1}{4}n(n+1)(n+2)(n+3)(n+4)$

44. $\int_0^{\infty} \frac{\sin^2 x}{x^2} dx$ be _____

- A. Convergent
- B. Divergent to $+\infty$
- C. Divergent to $-\infty$
- D. Oscillating infinity

45. The series $\sum \frac{n}{2^n}$ is _____

- A. Convergent
- B. Divergent
- C. Neither convergent nor divergent
- D. Conditionally convergent



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46. The simple poles of $f(z) = \frac{z+1}{z^2-2z}$ are _____
- A. $z = 0$ and $z = 2$
 - B. $z = 0$ and $z = 1$
 - C. $z = 1$ and $z = 2$
 - D. $z = 0$ and $z = -1$
47. In the Laurent series expansion of $f(z) = \frac{1}{z-1} - \frac{1}{z-2}$ valid in the region $|z| > 2$ the coefficient of $\frac{1}{z^2}$ is _____
- A. -1
 - B. 0
 - C. 1
 - D. 2
48. For the positively oriented unit circle, $\oint_{|z|=1} \frac{2\operatorname{Re}(z)}{z+2} dz$ equals _____
- A. 0
 - B. $2\pi i$
 - C. πi
 - D. $4\pi i$
49. Let $\omega = f(z)$, the bilinear transformation that maps the points $-1, 0, 1$ onto $-i, 1, i$ respectively then $f(1-i)$ equals _____
- A. $-1 + 2i$
 - B. $2i$
 - C. $-2 + i$
 - D. $-1 + i$
50. For the function $f(z) = \frac{1-e^z}{z}$, the point $z = 0$ is _____
- A. An essential singularity
 - B. Pole of order zero
 - C. Pole of order one
 - D. Removable singularity
51. The general solution of $(D^2 - 4D + 3)y = 0$ is _____
- A. $y = Ae^{3x} + Be^x$
 - B. $y = Ae^{-3x} + Be^{-x}$
 - C. $y = Ae^{4x} + Be^{-x}$
 - D. $y = Ae^{-4x} + Be^x$



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52. The radius of curvature of $x^4 + y = 2$ at the point (1, 1) is _____
- A. $\frac{\sqrt{2}}{3}$
 - B. $-\frac{\sqrt{2}}{3}$
 - C. $\frac{\sqrt{3}}{2}$
 - D. $-\frac{\sqrt{3}}{2}$
53. PDE of second order in canonical form $Rr + Ss + Tt + f(x, y, z, p, q) = 0$ then $S^2 - 4RT > 0$ represents _____
- A. Hyperbolic
 - B. Parabolic
 - C. Elliptic
 - D. Straight line
54. The equation $\frac{\partial^2 u}{\partial t^2} = C^2 \frac{\partial^2 u}{\partial x^2}$ is known as the _____
- A. One dimensional heat flow equation
 - B. One dimensional wave equation
 - C. Laplace equation
 - D. None of these
55. Which transform property helps when initial conditions are non-zero?
- A. The derivative property $sF(s) - f(0)$
 - B. Scaling property
 - C. Time reversal
 - D. Convolution property
56. Every countable set R has measure _____
- A. One
 - B. Two
 - C. Three
 - D. Zero
57. The number of limit points of Z in R with usual metric is _____
- A. 0
 - B. 1
 - C. 2
 - D. Infinity
58. A function whose only singularities in the entire complex plane are poles is called _____
- A. Analytic function
 - B. Meromorphic function
 - C. Holomorphic function
 - D. Regular function



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59. Which of the following set is countable?
- A. Set of all positive real numbers
 - B. $\{2^1, 2^2, 2^3, 2^4, \dots\}$
 - C. Set of all positive irrational numbers
 - D. Closed interval $[-1, 1]$
60. Which of the following is a topological property?
- A. Length
 - B. Area
 - C. Connectedness
 - D. Volume
61. The order of convergence of Newton-Raphson method is _____
- A. 0
 - B. 1.5
 - C. 3
 - D. 2
62. In Simpson's one-third rule the curve $y = f(x)$ is assumed to be a _____
- A. Circle
 - B. Parabola
 - C. Hyperbola
 - D. Ellipse
63. The Bisection method is also known as _____
- A. Secant method
 - B. Binary chopping
 - C. False position
 - D. Tangent method
64. The process of finding the value of x for the corresponding value of y is called _____
- A. Interpolation
 - B. Inverse interpolation
 - C. Cubic spline
 - D. Divided difference
65. Predictor-corrector methods, such as Adam's method or Milne's method, are generally not self-starting. What methods are typically used to obtain the necessary starting values?
- A. Newton-Raphson method
 - B. Picard's method or Taylor series method
 - C. Gauss-Seidel method
 - D. Euler's method or Runge-Kutta method



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66. The conditions for a normal distribution as a limiting form of binomial distribution are ____
- A. $n \rightarrow \infty$; neither p nor q is very small
 - B. $n \rightarrow 0$; neither p nor q is very small
 - C. $n \rightarrow \infty$; either p or q is very small
 - D. $n \rightarrow 0$; either p or q is very small
67. The co-efficient of correlation is ____
- A. Can take any value between -1 and +1
 - B. Is always less than -1
 - C. Is always more than +1
 - D. Cannot be zero
68. A bag contains 5 white and 3 black balls. Two balls are drawn at random one after the other without replacement. Find the probability that both balls drawn are black?
- A. $\frac{3}{8}$
 - B. $\frac{3}{28}$
 - C. $\frac{2}{7}$
 - D. $\frac{2}{27}$
69. If the sample size (n) in the Central Limit Theorem is increased, what happens to the standard deviation of the sampling distribution of the mean?
- A. It remains the same
 - B. It increases
 - C. It decreases
 - D. It becomes infinite
70. Which test is used to compare the means of two independent groups when the population variances are unknown?
- A. Z-test
 - B. T-test
 - C. Chi-square test
 - D. ANOVA

