

No. of Pages. 20

Code No.

**Y – 3052**

Register Number :

Time : 2 Hours

Name :

Max.Marks : 100

**Entrance Examination for Admission to the P.G. Courses in the  
Teaching Departments, 2026**

**CSS**

**MATHEMATICS/MATHEMATICS WITH FINANCE AND COMPUTATION**

**GENERAL INSTRUCTIONS**

1. The Question Paper is having 100 Objective Questions, each carrying one mark.
2. The answers are to be marked **only** in the “**OMR Sheet**” provided.
3. **Negative marking : 0.25 marks** will be deducted for each wrong answer .

**INSTRUCTIONS FOR FILLING THE OMR SHEET**

- The OMR sheet should not be folded or crushed.
- Use only blue/black ball point pen to fill the circles.
- Use of pencil is strictly prohibited.
- Circles should be darkened completely and properly.
- Cutting and erasing on this sheet is not allowed.
- Do not leave any stray marks on the sheet.
- Do not use marker or white fluid to hide the mark.

• **WRONG METHODS**



**CORRECT METHOD**



DO NOT WRITE HERE

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Choose appropriate answer from the options in the questions.

**(100 × 1 = 100 marks)**

1. Which of the following is an equivalence relation on  $\mathbb{Z}$ ?

A.  $aRb \Leftrightarrow a \leq b$

B.  $aRb \Leftrightarrow a - b$  is even

C.  $aRb \Leftrightarrow a < b$

D.  $aRb \Leftrightarrow a = b + 1$

2. Which of the following relations on a set  $A$  is always a partial order?

A.  $aRb \Leftrightarrow a = b$

B.  $aRb \Leftrightarrow a \neq b$

C.  $aRb \Leftrightarrow a + b = 0$

D.  $aRb \Leftrightarrow a > b$

3. Let  $f : \mathbb{R} \rightarrow \mathbb{R}$  be defined by  $f(x) = x^3 - 3x$ . Then :
- A. Bijective  
B. Injective only  
C. Surjective only  
D. Neither injective nor surjective
4. Find  $\lim_{x \rightarrow 0} \frac{e^x - 1 - x}{x^2}$
- A. 0  
B. 1  
C. 2  
D.  $\frac{1}{2}$
5. Which is continuous everywhere?
- A.  $\frac{1}{x}$   
B.  $|x|$   
C.  $\tan x$   
D.  $\frac{1}{x-1}$
6. If a function is differentiable at a point, then it is:
- A. Continuous at that point  
B. Discontinuous  
C. Not defined  
D. Constant
7. Let  $f(x) = |x|$ . Then  $f$  is
- A. Not continuous  
B. Differentiate everywhere  
C. Continuous but not differentiable at  $x = 0$   
D. None
8. If  $f$  is continuous on  $[a, b]$ , then:
- A. Constant  
B. Increasing  
C. Differentiable  
D. Bounded

9. Let  $f : [0, 1] \rightarrow \mathbb{R}$  be continuous on  $[0, 1]$ , differentiable on  $(0, 1)$ , and  $f(0) = f(1) = 0$ . Then which is true?
- A.  $f'(x) = 0$  for all  $x$
  - B. There exists exactly one  $c$  such that  $f'(c) = 0$
  - C. There exists atleast one  $c \in (0, 1)$  such that  $f'(c) = 0$
  - D. No such  $c$  exists
10. If  $f'(x) \leq 2$  for all  $x \in [a, b]$ , then
- A.  $f(b) - f(a) \leq 2(b - a)$
  - B.  $f(b) - f(a) = 2(b - a)$
  - C.  $f(b) - f(a) \geq 2(b - a)$
  - D. None
11. The number of ways in which 5 different books can be arranged on a shelf is \_\_\_\_\_
- A. 25
  - B. 60
  - C. 120
  - D. 5
12. Number of ways to choose 2 students from 6
- A. 30
  - B. 15
  - C. 12
  - D. 6
13. Number of 4-digit numbers formed using digits 1,2,3,4,5 without repetition
- A. 120
  - B. 60
  - C. 24
  - D. 625



20.  $\int_0^1 \frac{dx}{1+x^2}$

A.  $\frac{\pi}{2}$

B.  $\frac{\pi}{4}$

C. 1

D. 0

21. The sum  $1+2+\dots+n$  equals

A.  $n^2$

B.  $\frac{n(n-1)}{2}$

C.  $\frac{n(n+1)}{2}$

D.  $2n$

22. If  $a = bq + r$ , then  $r$  satisfies

A.  $r \geq 0$

B.  $r < b$

C.  $0 \leq r < b$

D. None

23. If  $a|b$  and  $a|c$ , then

A.  $a|(b+c)$

B.  $a|(b-c)$

C.  $a|(mb+nc)$

D. All

24. If  $\gcd(a, b) = 1$ , then

A.  $a$  and  $b$  are relative prime

B.  $a$  and  $b$  are prime

C.  $a = b$

D. One divides other







43. Which of the following is always a normal subgroup?
- A. Any subgroup  
B. Cyclic subgroup  
C. Subgroup of prime order  
D. Kernel of homomorphism
44. The order of permutation  $(1234)(56)$  is
- A. 2  
B. 4  
C. 6  
D. 12
45. Number of homomorphism from  $\mathbb{Z} \rightarrow \mathbb{Z}_6$
- A. 1  
B. 6  
C. 2  
D. Infinite
46. Consider  $(2xy + y^2)dx + (x^2 + 2xy)dy = 0$ . This equation is
- A. Exact  
B. Not exact  
C. Linear  
D. Bernoulli
47. Wronskian of  $x$  and  $x^2$  is
- A. 0  
B.  $x$   
C.  $x^2$   
D.  $x^3$
48. Solution of  $y'' - y = 0$
- A.  $C_1 + C_2x$   
B.  $C_1 \cos x + C_2 \sin x$   
C.  $C_1e^x + C_2e^{-x}$   
D.  $C_1e^x + C_2e^{-x}$
49. The integrating factor of  $\frac{dy}{dx} + 2y = e^x$
- A.  $e^{-2x}$   
B.  $e^{2x}$   
C.  $e^{-x}$   
D.  $x$

50. The equation  $\frac{dy}{dx} = \frac{y}{x}$  represents
- A. Parabolas
  - B. Circles
  - C. Straight lines
  - D. Hyperbolas
51. The set of even natural numbers is
- A. Finite
  - B. Countably infinite
  - C. Uncountable
  - D. Empty
52. The completeness property states
- A. Every bounded set has a maximum
  - B. Every sequence converges
  - C. Every set is finite
  - D. Every bounded above set has a supremum
53. Every bounded sequence has
- A. Limit
  - B. Convergent subsequence
  - C. Maximum
  - D. Minimum
54. The sequences  $a_n = (-1)^n$  has
- A. Limit exists
  - B. Exactly one limit point
  - C. Two limit points
  - D. No limit point
55. Which of the following sequences is Cauchy?
- A.  $n$
  - B.  $(-1)^n$
  - C.  $n^2$
  - D.  $\frac{1}{n}$

56. The series  $\sum \frac{1}{n}$  is
- A. Divergent  
B. Convergent  
C. Absolutely convergent  
D. Conditionally convergent
57. Which is continuous on  $\mathbb{R}$ ?
- A.  $\frac{1}{x}$   
B.  $\sin x$   
C.  $\frac{1}{1-x}$   
D.  $\log x$
58. The function  $f(x) = x^2$  is uniformly continuous on
- A.  $\mathbb{R}$   
B.  $(0, 1)$   
C.  $(0, \infty)$   
D.  $[0, 1]$
59. Which function is not Riemann integrable on  $[0, 1]$ ?
- A.  $f(x) = x^2$   
B. Step function  
C. Dirichlet function  
D. Continuous function
60. A bounded function with finite discontinuities is
- A. Not integrable  
B. Riemann integrable  
C. Divergent  
D. None
61. A matrix  $A$  is both symmetric and skew-symmetric. Then  $A$  must be
- A. Zero matrix  
B. Identity matrix  
C. Diagonal matrix  
D. Orthogonal matrix



69. Let  $T : \mathbb{R}^3 \rightarrow \mathbb{R}^2$  be a linear transformation. Then
- A. Cannot be onto
  - B. Cannot be one-one
  - C. Both
  - D. None
70. Let  $T : V \rightarrow V$  be a linear transformation. If  $\dim(V) = 5$ ,  $\text{nullity}(T) = 2$ , then rank
- A. 7
  - B. 5
  - C. 3
  - D. 2
71. Kernel of a linear transformation  $T$  is
- A. Always empty
  - B. Subspace
  - C. Finite set
  - D. Not defined
72. Matrix of linear transformation  $T$  depends on
- A. Only  $T$
  - B. Only basis
  - C. Both  $T$  and basis
  - D. None
73. Let  $A$  be a real symmetric matrix. Then
- A. Eigenvalues are complex
  - B. Not diagonalizable
  - C. Not invertible
  - D. Eigen values are real
74. If all eigen values of a matrix are distinct, then the matrix is
- A. Diagonalizable
  - B. Not diagonalizable
  - C. Singular
  - D. Nilpotent
75. If  $A$  is diagonalizable, then
- A. Only one eigen vector
  - B. Enough independent eigenvectors
  - C. Rank zero
  - D. None

76. Let  $R$  be a ring with unity. If  $ab = 0 \Rightarrow a = 0$  or  $b = 0$ , then  $R$  is

- A. Integral domain
- B. Division ring
- C. Field
- D. Boolean ring

77. Which of the following is a field?

- A.  $\mathbb{Z}$
- B.  $\mathbb{Z}_6$
- C.  $\mathbb{Z}_7$
- D.  $2\mathbb{Z}$

78. Let  $\phi: \mathbb{Z} \rightarrow \mathbb{Z}_n$  be defined by  $\phi(k) = k(\text{mod } n)$ , then

- A. Injective
- B. Surjective
- C. Isomorphism
- D. Zero map

79. Kernel of a ring homomorphism is always

- A. Field
- B. Integral domain
- C. Division ring
- D. Ideal

80. A finite integral domain is always

- A. Ring
- B. Field
- C. Group
- D. Boolean ring

81. Number of ring homomorphism from  $\mathbb{Z} \rightarrow \mathbb{Z}_6$

- A. 1
- B. 2
- C. 6
- D. Infinite

82. A finite field has order

- A. Prime
- B. Prime power
- C. Even
- D. Odd

83. A polynomial  $f(x) \in F[x]$  is irreducible if
- A. No roots
  - B. Degree is prime
  - C. Constant polynomials
  - D. Cannot be factored into lower degree polynomials
84. Every maximal ideal is
- A. Prime ideal
  - B. Field
  - C. Subfield
  - D. None
85. Which ideal is prime in  $\mathbb{Z}$ ?
- A. (6)
  - B. (8)
  - C. (5)
  - D. (10)
86. If  $f(z) = \bar{z}$ , then  $f(z)$  is
- A. Analytic everywhere
  - B. Analytic nowhere
  - C. Analytic at origin
  - D. Harmonic
87. Number of zeros of  $z^4 = 1$
- A. 1
  - B. 2
  - C. 3
  - D. 4
88. If  $f(z)$  is analytic and bounded, then
- A. Constant
  - B. Polynomial
  - C. Zero
  - D. Periodic

89. If  $f$  is analytic, then it is

- A. Continuous
- B. Infinitely differentiable
- C. Both
- D. None

90. Singularity of  $\frac{\sin z}{z}$  at  $z = 0$

- A. Pole
- B. Removable
- C. Essential
- D. Branch point

91. Laurent series valid in

- A. Disk
- B. Line
- C. Plane
- D. Annulus

92. Residue at simple pole is

- A. Coefficient of  $(z - a)^{-1}$
- B. Constant term
- C. Highest power
- D. None

93. Essential singularity example

- A.  $\frac{1}{z}$
- B.  $e^{\frac{1}{z}}$
- C.  $z^2$
- D.  $\log z$

94. Argument principle count

- A. Zero
- B. Poles
- C. Both
- D. None

95. Evaluate  $\int_{|z|=1} \frac{dz}{z^2}$

A. 0

B.  $2\pi i$

C.  $\pi i$

D. Undefined

96. Equation of line with slope 2 passing through (1,3)

A.  $y = 2x - 1$

B.  $y = 2x + 1$

C.  $y = 2x + 3$

D.  $y = x + 2$

97. Equation of circle with center (0,0) and radius 2

A.  $x^2 + y^2 = 1$

B.  $x^2 + y^2 = 2$

C.  $x^2 + y^2 = 4$

D.  $x^2 + y^2 = 8$

98. Equation of hyperbola is

A.  $x^2 + y^2 = a^2$

B.  $x^2 - y^2 = a^2$

C.  $xy = a$

D.  $y^2 = 4ax$

99. Find Laplace transform  $\mathcal{L}\{1\} =$

A.  $s$

B.  $1/s$

C.  $s^2$

D. 0

100. Find the inverse Laplace transform  $\mathcal{L}^{-1}\left\{\frac{1}{s^2}\right\}$

A.  $t$

B. 1

C.  $t^2$

D.  $e^t$

## **ROUGH WORK**

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