No. of Pages. 20

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Register Number :

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Time : 2 Hours

Max.Marks : 100

Entrance Examination for Admission to Four Year Under Graduate Programmes in the Teaching Departments, 2026

CSS

MATHEMATICS

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

Choose appropriate answer from the options in the questions.

(100 × 1 = 100 marks)

1. The angle between the two vectors $\vec{a}$ and $\vec{b}$ with magnitude $\sqrt{3}$ and $\sqrt{2}$ respectively and $\vec{a} \cdot \vec{b} = 3\sqrt{2}$ is

   A. $\cos^{-1}\left(\frac{2}{\sqrt{3}}\right)$

   B. $\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$

   C. $\cos^{-1}\sqrt{3}$

   D. $\cos^{-1}\sqrt{2}$

2. If $\vec{a} = \vec{i} - \vec{j} + 3\vec{k}$, $\vec{b} = 5\vec{i} - 2\vec{j} + \vec{k}$ and $\vec{c} = \vec{i} - \vec{j}$ are such that $\vec{a} + \mu\vec{b}$ is perpendicular to $\vec{c}$, then the value of μ is

A. $\frac{5}{2}$ B. $\frac{7}{2}$

C. $\frac{9}{2}$ D. $\frac{11}{2}$

3. The projection of the vector $\vec{b} = 2\vec{i} + 2\sqrt{2}\vec{j} - 2\vec{k}$ on the vector $\vec{a} = \vec{i} - \vec{j} - \sqrt{2}\vec{k}$ is

A. 1 B. $\sqrt{2}$

C. $2\sqrt{2}$ D. 2

4. If $\left(\vec{i} + \vec{j} - \vec{k}\right) \times \left(3\vec{i} + a\vec{j} + b\vec{k}\right) = \vec{0}$, then the values of *a* and *b* are

A. $a = 1,\ b = 3$ B. $a = -3,\ b = 3$

C. $a = 3,\ b = -3$ D. $a = \frac{1}{3},\ b = \frac{-1}{3}$

5. The unit vector parallel to the sum of the vectors $\vec{i} + \vec{j} + \vec{k}$ and $2\vec{i} - 3\vec{j} + 5\vec{k}$ is

A. $\frac{3}{7}\vec{i} - \frac{2}{7}\vec{j} + \frac{6}{7}\vec{k}$ B. $\frac{3}{7}\vec{i} + \frac{2}{7}\vec{j} + \frac{6}{7}\vec{k}$

C. $\frac{3}{7}\vec{i} - \frac{2}{7}\vec{j} - \frac{6}{7}\vec{k}$ D. $\frac{-3}{7}\vec{i} + \frac{2}{7}\vec{j} + \frac{6}{7}\vec{k}$

6. The vector equation for the line passing through the points $(-1, 0, 2)$ and $(3, 4, 6)$ is

A. $-\vec{i} + 2\vec{k} + \lambda + 4\vec{j}$ B. $-\vec{i} + 2\vec{k}$

C. $-\vec{i} + 2\vec{k} + \lambda\left(4\vec{i} + 4\vec{j} + 4\vec{k}\right)$ D. $-\vec{i} + 2\vec{k} + \lambda\left(\vec{i} + 4\vec{j} + \vec{k}\right)$

7. The value of $\left|\vec{a}-\vec{b}\right|$, where the two vectors $\vec{a}$ and $\vec{b}$ are such that $\left|\vec{a}\right|=2$, $\left|\vec{b}\right|=3$ and $\vec{a}\cdot\vec{b}=4$ is

A. 5 B. $\sqrt{5}$

C. $\frac{1}{\sqrt{5}}$ D. $\frac{3}{\sqrt{5}}$

8. The equation of directrix of the parabola $y^2=-100x$ is

A. $x=50$ B. $x=25$

C. $x=-50$ D. $x=-25$

9. The equation of parabola which is symmetric about x-axis with vertex $(0, 0)$ and pass through $(3, 6)$ is

A. $y^2=12x$ B. $y^2=-12x$

C. $x^2=12y$ D. $x^2=-12y$

10. The eccentricity of the ellipse $\frac{x^2}{25}+\frac{y^2}{16}=1$ is

A. $\frac{1}{5}$ B. $\frac{2}{5}$

C. $\frac{3}{5}$ D. $\frac{3}{4}$

11. The length of latus rectum for hyperbola $\frac{x^2}{9}-\frac{y^2}{16}=1$

A. $\frac{5}{32}$ B. $\frac{25}{3}$

C. $\frac{3}{32}$ D. $\frac{32}{3}$

12. The equation of hyperbola, whose foci $(0, 5)$ and the length of semi transverse axis 3 units, is

A. $\frac{x^2}{4^2} - \frac{y^2}{3^2} = 1$ B. $\frac{x^2}{3^2} - \frac{y^2}{4^2} = 1$

C. $\frac{y^2}{4^2} - \frac{x^2}{3^2} = 1$ D. $\frac{y^2}{3^2} - \frac{x^2}{4^2} = 1$

13. The three points (1, 2, 3), (3, 1, 2), (2, 3, 1) form

A. an equilateral triangle B. a right angled triangle

C. an isosceles triangle D. a right angled isosceles triangle

14. The coordinates of a point dividing the line segment joining the points (1, 2, 3) and (4, 5, 6) externally in the ratio 2 : 1 is

A. (6, 7, 8) B. (7, 8, 9)

C. (8, 6, 4) D. (7, 9, 8)

15. The coordinates of the centroid of a triangle, whose vertices have coordinates (7, 6, 4), (5, 4, 6), (9, 5, 8), are

A. (7, 5, 3) B. (7, 5, 2)

C. (5, 7, 3) D. (6, 6, 4)

16. The polar form of $4 + 4\sqrt{3i}$ is

A. $6e^{i\frac{\pi}{4}}$ B. $8e^{i\frac{\pi}{2}}$

C. $6e^{i\frac{\pi}{3}}$ D. $8e^{i\frac{\pi}{3}}$

17. If ω is a complex cube root of unity, then $(1+\omega)^3 - (1+\omega^2)^3 =$

A. 1 B. –1

C. i D. 0

18. The value of $1 + i^2 + i^4 + i^6 + ... + i^{2n}$ is

A. 0 B. –1

C. 1 D. none of these

19. The number of complex numbers z satisfying $\mathrm{Re}(z^2) = 0$, $|z| = \sqrt{3}$ is

A. 0 B. 2

C. 3 D. 4

20. The locus of z if $\mathrm{Re}(z+1) = |z-1|$ is

A. $y = 4x$ B. $y = 4x^2$

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

21. If $\left(\sqrt{8}+i\right)^{50} = 3^{49}(a+ib)$, then the value of a^2+b^2 is

A. 3 B. 9

C. 27 D. 81

22. If $z = 4+i\sqrt{7}$, then value of $z^3 - 4z^2 - 9z + 91$ is equal to

A. 0 B. 1

C. –1 D. 2

23. The number of solutions of the equation $z^2 + |z^2| = 0$, where $z \in \mathbb{C}$ is

A. one B. two

C. three D. infinitely many

24. If the S.D. is a set of observations is 4 and if each observation is divided by 4, the S.D. of the new observations is

A. 1 B. 2

C. 3 D. 4

25. The mean of 5 observations is 3 and variance is 2. If three of the five observations are 1, 3, 5, then the other two observations are

A. 2, 6 B. 2, 4

C. 1, 5 D. 3, 3

26. If the median of 21 observations is 40 and if the observations greater than the median are increased by 5 then the median of the new data will be

A. 45 B. 40

C. $40+\frac{50}{21}$ D. $45-\frac{50}{21}$

27. If the standard deviation of a set of observations is 4 and if each observation is divided by 4, the standard deviation of the new set of observations will be

A. 4 B. 3

C. 2 D. 1

28. If the 3^{rd} term of an A.P. is 6 and the 56^{th} term of that A.P. is 12, then the 21^{st} term is

A. 58 B. 60

C. 62 D. 64

29. In the A.P. 171, 162, 153, ..., the first negative term is

A. –1 B. –3

C. –9 D. –11

30. In G.P. 4, 8, 16, 32, ..., the sum up to 5^{th} term is

A. 120 B. 124

C. 126 D. 134

31. If the sum of first three terms of a G.P. is $\frac{21}{2}$ and their product is 27, then the common ratio that is not an integer is

A. $\frac{3}{2}$ B. $\frac{1}{2^2}$

C. $\frac{1}{2}$ D. $\frac{1}{3}$

32. If A.M. of two numbers is $\frac{15}{2}$ and their G.M. is 6, then the two numbers are

A. 6 and 3 B. 6 and 4

C. 12 and 2 D. 12 and 3

33. The directional cosines of *y*-axis are

A. 0, 1, 0 B. 1, 1, 0

C. 0, 1, 1 D. 1, 1, 1

34. The angle between two lines $\frac{x+1}{2}=\frac{y+3}{2}=\frac{z-4}{-1}$ and $\frac{x-4}{1}=\frac{y+4}{2}=\frac{z+1}{2}$ is

A. $\cos^{-1}(1/9)$ B. $\cos^{-1}(2/9)$

C. $\cos^{-1}(3/9)$ D. $\cos^{-1}(4/9)$

35. If lines $\frac{x-1}{-3}=\frac{y-2}{2k}=\frac{z-3}{2}$ and $\frac{x-1}{3k}=\frac{y-5}{1}=\frac{z-6}{-5}$ are mutually perpendicular, then $k =$

A. –10/7 B. –7/10

C. –10 D. –7

36. If $\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}, \alpha$ are the directional cosines of a vector, then α is

A. $\frac{1}{\sqrt{3}}$ B. $\frac{-1}{\sqrt{3}}$

C. $\frac{1}{3}$ D. both (A) and (B)

37. If $\sin x = \frac{1}{2}$, then $\sin 3x =$

A. $\frac{\sqrt{3}}{2}$ B. $\frac{1}{2}$

C. $\frac{1}{\sqrt{2}}$ D. 1

38. $\cos 75^\circ + \cos 15^\circ =$

A. $\sqrt{3}$ B. $\frac{\sqrt{3}}{\sqrt{2}}$

C. $\frac{\sqrt{1}}{\sqrt{2}}$ D. $\frac{\sqrt{1}}{\sqrt{3}}$

39. The value of $\tan\left[\frac{\pi}{2}\sin^2 x\right]$ lies in

A. [–1, 1] B. $[0, \infty)$

C. [0, 1] D. $(-\infty, \infty)$

40. If $\tan\theta + \sec\theta = 1$ then $\cos\theta =$

A. 0 B. 1

C. –1 D. no solution

41. The value of $\text{cosec}\left(-1080^\circ\right)$ is

A. 2 B. $\frac{1}{2}$

C. 0 D. ∞

42. If $\sin a + \sin b = \sqrt{\frac{5}{3}}$ and $\cos a + \cos b = 1$, then $\cos(a-b)$ is equal to

A. $\frac{1}{3}$ B. $\frac{2}{3}$

C. $\frac{3}{4}$ D. 1

43. The function $f(x) = (x-1)^{\frac{1}{2-x}}$ is not defined at $x = 2$. The value of $f(2)$ so that f is continuous at $x = 2$ is

A. 1 B. e

C. $1/e$ D. $1/e^2$

44. If $f(9)=9$, $f'(9)=4$, then $\lim_{x\to 9}\frac{\sqrt{f(x)}-3}{\sqrt{x}-3}$ is equal to

A. 2 B. –2

C. –4 D. 4

45. Maximum value of $2997\sin x+3996\cos x$ is equal to

A. 4998 B. 4932

C. 4900 D. 4995

46. Which of the following limits does not yield 1?

A. $\lim_{x\to 0}\frac{\sin x}{x}$ B. $\lim_{x\to 0}\frac{\tan x}{\cot x}$

C. $\lim_{x\to 0}\frac{1}{e^x}+\cos x$ D. $\lim_{x\to 0} x\,\mathrm{cosec}\,x$

47. $\lim_{n\to\infty}\frac{1+2+\ldots+n}{2n^2+3n+1}=$

A. $\frac{1}{2}$ B. $\frac{1}{4}$

C. 0 D. 1

48. Let $f:[0,\infty)\to\mathbb{R}$ be defined by $f(x)=\sqrt{x}$. Then

A. f is one-one B. f is onto

C. f is both one-one and onto D. f is neither one-one nor onto

49. Let f be a continuous function on $[0,4]$. If $f(x)$ takes rational values for all x and $f(4)=2025$ then $f(\pi)$ is

A. 0 B. 2025

C. π D. 1

50. The differentiability of $f(x)=|x-3|$ at $x=3$ is

A. 0 B. –3

C. 3 D. not existing

51. The integrating factor of the differential equation $\frac{dy}{dx} + y \tan x = \sec x$ is

A. $\sec x$ B. $\tan x$

C. $\sin x$ D. $\cos x$

52. If $y = \frac{1}{1+x+x^2+x^3}$, then what is the value of $\frac{dy}{dx}$ at $x = 0$?

A. 1 B. –1

C. 2 D. –2

53. The degree of differential equation $x = 1 + \left(\frac{dy}{dx}\right) + \frac{1}{2!}\left(\frac{dy}{dx}\right)^2 + \frac{1}{3!}\left(\frac{dy}{dx}\right)^3 + \ldots$ is

A. 3 B. 1

C. 2 D. not defined

54. The differential equation satisfied by $y = e^{2x} + 2$ is

A. $y'' + y' = 0$ B. $y'' - y' = 0$

C. $y'' - 2y' = 0$ D. $y'' = e^{2x}$

55. The solution of $\frac{dy}{dx} = 2^{2y-x}$ is

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

C. $\frac{1}{2^x} - \frac{1}{2^y} = C$ D. $\frac{1}{2^x} - \frac{1}{2^{2y-1}} = C$

56. The solution of the differential equation $2x\frac{dy}{dx} - y = 5$ represents

A. circles B. straight lines

C. ellipses D. parabolas

57. The domain of the function defined by $f(x) = \sin^{-1}\sqrt{x-1}$ is

A. $(-1, 1)$ B. $[-1, 1]$

C. $[0, 1]$ D. $[-1, 0]$

58. The number of one-one functions from A to A, where $A = \{1, 2, 3\}$, is

A. 1 B. 2

C. 4 D. 6

59. The range of the function $f : \mathbb{R} \to \mathbb{R}$ defined by $f(x) = e^x$ is

A. $(0, \infty)$ B. $[0, \infty)$

C. $\mathbb{R}$ D. $\mathbb{R} - \{0\}$

60. An onto function $f : \{1, 2, 3, 4, 5\} \to \{6, 7, 8, 9, 10\}$ is

A. not one-one B. always one-one

C. never one-one D. one-one if f is identity

61. The mapping $f : [-2, 2] \to \mathbb{R}$, defined by $f(x) = x|x|$, is

A. bijective B. non one-one but onto

C. not onto D. not a function

62. If $f(x)$ is an odd periodic function with period 2, then $f(4)$ equals

A. –4 B. 4

C. 2 D. 0

63. The range of the function $f(x) = x^2 - 2x - 4$ is

A. $[-5, \infty)$ B. $(-5, \infty)$

C. $(-5, 0)$ D. $[-5, 5]$

64. If set A has 2 elements and set B has 4 elements, then the maximum number of relations from A to B is

A. 32 B. 128

C. 256 D. 64

65. The number of constant functions from a set containing m elements to a set containing n elements is

A. mn B. m
C. n D. $m+n$

66. Which one of the following matrices is orthogonal?

A. $\begin{pmatrix} \cos\theta & \sin\theta \\ \sin\theta & \cos\theta \end{pmatrix}$ B. $\begin{pmatrix} 0 & -i \\ i & 0 \end{pmatrix}$, where $i = \sqrt{-1}$

C. $\begin{pmatrix} 0 & i \\ -i & 0 \end{pmatrix}$, where $i = \sqrt{-1}$ D. $\begin{pmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{pmatrix}$

67. The rank of the matrix $\begin{bmatrix} -1 & -2 & -3 & -4 \\ 2 & 4 & 6 & 8 \\ 1 & 2 & 3 & 4 \end{bmatrix}$ is

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

68. If $A = \begin{pmatrix} 7 & 3 \\ 1 & 2 \end{pmatrix}$, then $9I_2 - A$ s equal to

A. A^{-1} B. $\frac{A^{-1}}{2}$
C. $3A^{-1}$ D. $2A^{-1}$

69. The value of x for which $A = \begin{pmatrix} 1 & -3 & 2 \\ 4 & -1 & x \\ 3 & 5 & 2 \end{pmatrix}$ is singular is

A. 31/7 B. 32/7
C. 33/7 D. 34/7

70. The matrix $A = \begin{pmatrix} 2 & 3 \\ 1 & 2 \end{pmatrix}$ satisfies the equation

A. $A^2 - I = 2A$ B. $A^2 - 2A + I = 0$
C. $A^2 - 2I = 0$ D. $A^2 - 4A + I = 0$

71. Let A be the square matrix of order 5×5, then $|kA|$ is equal to _____.

A. $k|A|$ B. $k^5|A|$

C. $5k|A|$ D. $\frac{k|A|}{5}$

72. How many three digit numbers can be formed using {1, 2, 3} with repetition?

A. 3! B. 3^3

C. 2^3 D. 1

73. The number of arrangements of alphabets α, α, α, α, β, γ, δ such that no two α's are adjacent is

A. 3! B. 4!

C. 5! D. 6!

74. In a cricket squad of 15 members, only 5 can bowl. The probability that in a team of 11 members at least 4 bowlers are selected is

A. $\frac{2}{455}$ B. $\frac{6}{1365}$

C. $\frac{40}{91}$ D. $\frac{54}{91}$

75. The number of all possible matrices of order 3×3 with each entry 0 or 1 is

A. 27 B. 256

C. 81 D. 512

76. The number of ways in which the number 94864 can be resolved as a product of two factors is

A. 22 B. 24

C. 23 D. 26

77. If the number of terms in the expression $(x+y+z)^n$ is 36 then the value of n is

A. 8 B. 7

C. 9 D. 10

78. What is the maximum number of different elements required to form a symmetric matrix of order 12?

A. 72 B. 78

C. 75 D. 70

79. In a group of 8 girls, two girls are sisters. The number of ways in which the girls can sit so that two sisters are not sitting together is

A. 4820 B. 1410

C. 2830 D. None of these

80. Two numbers x and y are selected at random from the set $\{1, 2, 3, ..., 3N\}$. The probability that $x^2 - y^2$ is divisible by 3 is

A. $\frac{3N-1}{3N}$ B. $\frac{N-1}{N}$

C. $\frac{5N-3}{9N-3}$ D. None of these

81. A fair coin is tossed n times. If the probability that head occurs 6 times is equal to the probability that head occurs 8 times, then value of n is

A. 24 B. 48

C. 14 D. 16

82. Six distinct numbers are selected from first 150 natural numbers. The probability that all the six numbers are divisible both 3 and 5 is

A. 1/33 B. 1/35

C. 1/49 D. None of these

83. Vertices of a triangle are (0, 0), (41a, 37) and (–37, 41b) where a and b are the roots of the equation $3x^2 - 16x + 15 = 0$. The area of the triangle is equal to

A. 4678 B. 4356

C. 4887 D. 4879

84. Let $P(A)=\frac{7}{10}$ and $P(B)=\frac{3}{10}$. If A and B are independent, then $P(A\cap B)$ is

A. $\frac{3}{10}$ B. $\frac{7}{10}$

C. $\frac{21}{100}$ D. $\frac{1}{2}$

85. A bag contains 5 green and 3 blue balls. Two balls are picked at random. The probability that both are of the same colour is

A. $\frac{{}^5C_2+{}^3C_2}{{}^8C_2}$ B. $\frac{{}^5C_2\times{}^3C_2}{{}^8C_2}$

C. $\frac{{}^5C_1+{}^3C_1}{{}^8C_2}$ D. $\frac{{}^3C_2}{{}^8C_2}$

86. The number of ways of arranging the letters of the name EULER is

A. 24 B. 10

C. 120 D. 60

87. The number of subsets of $\{2, 3, 4, 5, 6, 7, 8, 9\}$ that contains at least one composite number is

A. 16 B. 32

C. 64 D. 240

88. Suppose a matrix A satisfies $A^2-5A+7I=0$. If $A^2=aA+bI$, find a

A. 1265 B. 5299

C. 1259 D. 5432

89. If α, β, γ are the roots of the equation $x^3+4x+1=0$, then the value of $(\alpha+\beta)^{-1}+(\beta+\gamma)^{-1}+(\gamma+\alpha)^{-1}$ is

A. 2 B. –1

C. 4 D. 0

90. If α and β are the roots of $x^2 + x + 1 = 0$, then $\alpha^{2026} + \beta^{2026} =$

A. 0 B. 1

C. –1 D. *i*

91. The product of squares of roots of the polynomial $x^3 - 3x^2 + 1$ is

A. 1 B. 3

C. –3 D. *i*

92. If $x^2 - 2kx + 2 = 0$ has equal roots, then the value of *k* is

A. 1 B. 2

C. $\sqrt{2}$ D. $\sqrt[3]{2}$

93. $\int \frac{x^4}{x^5 + 6} dx =$

A. $\log\left(x^5 + 6\right)^5 + c$ B. $\log\left(x^5 + 6\right)^{\frac{1}{5}} + c$

C. $\frac{1}{16}\cot^{-1}\left(\frac{x}{6}\right) + c$ D. $\frac{1}{16}\tan^{-1}\left(\frac{x}{6}\right) + c$

94. If $\int f(x)dx = f(x)$, then $\int [f(x)]^2 dx =$

A. $\frac{[f(x)]^2}{2} + c$ B. $f'(x) + c$

C. $\log(f(x)) + c$ D. $\log(f'(x)) + c$

95. $\int \frac{1}{x^2 + 16} dx =$

A. $\frac{1}{16}\sin^{-1}\left(\frac{x}{4}\right) + c$ B. $\frac{1}{4}\cos^{-1} x + c$

C. $\frac{1}{4}\tan^{-1}\left(\frac{x}{4}\right) + c$ D. $\frac{1}{16}\cot^{-1}\left(\frac{x}{4}\right) + c$

96. $\int (f(x)g''(x) - g(x)f''(x))dx =$

A. $f(x)g(x) - g''(x)f'(x) + c$

B. $f'(x)g'(x) - g'(x)f'(x) + c$

C. $f(x)g(x) - g'(x)f'(x) + c$

D. $f(x)g'(x) - g(x)f'(x) + c$

97. The value of $\int_0^1 x(1+x)^{88}dx$ is

A. 0

B. $\frac{1}{8010}$

C. $\frac{-1}{8010}$

D. 1

98. The value of $\int_{-\infty}^{0} e^x dx$ is

A. 0

B. π

C. log 2

D. 1

99. $\frac{d}{dx}\left(\cos^{-1}\left(\sqrt{\frac{1+x}{2}}\right)\right) =$

A. $\frac{1}{2\sqrt{1-x^2}}$

B. $\frac{-1}{2\sqrt{1-x^2}}$

C. $\frac{1}{2\sqrt{1-x}}$

D. $\frac{-1}{2\sqrt{1-x}}$

100. $\frac{d}{dx}\left(\tan^{-1}\left(\frac{1-\cos 3x}{\sin 3x}\right)\right) =$

A. $\frac{2}{3}$

B. $\frac{-2}{3}$

C. $\frac{3}{2}$

D. $\frac{-3}{2}$

ROUGH WORK

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