JECA–2017

Subject : Mathematics

Time Allowed : 2 Hours | *Maximum Marks* : 100

50100137

Booklet No. .....

INSTRUCTIONS

Candidates should read the following instructions carefully before answering the questions:

1. This question paper contains **100** MCQ type objective questions. Each question has four answer options given, viz. A, B, C and D.
2. Only one answer is correct. Correct answer will fetch full marks 1. Incorrect answer or any combination of more than one answer will fetch $-\frac{1}{4}$ marks. No answer will fetch 0 marks.
3. Questions must be answered on OMR sheet by darkening the appropriate bubble marked A, B, C, and D.
4. Use only **Black/Blue ball point pen** to mark the answer by complete filling up of the respective bubbles.
5. Mark the answers only in the space provided. Do not make any stray mark on the OMR.
6. Write question booklet number and your roll number carefully in the specified locations of the OMR. Also fill appropriate bubbles.
7. Write your name (in block letter), name of the examination centre and put your full signature in appropriate boxes in the OMR.
8. The OMRs will be processed by electronic means. Hence it is liable to become invalid if there is any mistake in the quesion booklet number or roll number entered or if there is any mistake in filling corresponding bubbles. Also it may become invalid if there is any discrepancy in the name of the candidate, name of the examination centre or signature of the candidate vis-a-vis what is given in the candidate's admit card. The **OMR** may also become invalid due to folding or putting stray marks on it or any damage to it. The consequence of such invalidation due to incorrect marking or careless handling by the candidate will be sole responsibility of candidate.
9. Rough work must be done on the question paper itself. Additional blank pages are given in the question paper for rough work.
10. Handover the OMR to the invigilator before leaving the Examination Hall.

Space for Rough Work

JECA – 2017

Mathematics

1. The distance of the point (x, y) from y-axis is

(A) x (B) y

(C) $|x|$ (D) $|y|$

2. Let O (0,0), P (3,4), Q (6,0) be the vertices of the triangle OPQ. The point R inside the triangle OPQ is such that the triangles OPR, PQR, OQR are of equal area. The co-ordinate of R are

(A) $\left(\frac{4}{3}, \frac{2}{3}\right)$ (B) $\left(3, \frac{2}{3}\right)$

(C) $\left(3, \frac{4}{3}\right)$ (D) $\left(\frac{4}{3}, 3\right)$

3. Polar co-ordinates of (–2, –2) is

(A) $\left(2\sqrt{2}, \frac{3\pi}{4}\right)$ (B) $\left(2\sqrt{2}, -\frac{3\pi}{4}\right)$

(C) $\left(2\sqrt{2}, \frac{\pi}{4}\right)$ (D) $\left(2\sqrt{2}, -\frac{\pi}{4}\right)$

4. The polar form of the equation $y = x\tan\alpha$ is

(A) $\theta = \alpha$ (B) $\theta = -\alpha$

(C) $\theta = \pi + \alpha$ (D) $\theta = \pi - \alpha$

5. The equation of the image of the line $2y - x = 1$ obtained by the reflexion on the line $4y - 2x = 5$ is

(A) $2y - x = 4$ (B) $4y - 2x = 7$

(C) $4y - 2x = \frac{7}{2}$ (D) $4y - 3x = 3$

6. If the algebraic sum of the perpendicular distances of a variables line from three points (0,2), (2,0) and (1,1) is zero, then the line always passes through the point

(A) (1,1) (B) (0,1)

(C) (1,0) (D) (2,2)

7. The equation of the line through the intersection of lines $2x + 3y + 4 = 0$ and $3x + 4y - 5 = 0$ and perpendicular to $7x - 5y + 8 = 0$ is

(A) $5x + 7y - 1 = 0$ (B) $5x + 7y + 1 = 0$

(C) $5x + 7y - 3 = 0$ (D) $5x + 7y + 3 = 0$

8. If (–2, 6) is the image of the point (4, 2) with respect to the line $L = 0$, then $L =$

(A) $3x - 2y + 5$ (B) $3x - 2y + 10$

(C) $2x + 3y - 5$ (D) $6x - 4y - 7$

9. The equation $y^2 = 4x + 4y$ changes to the form $y^2 = 4x$ if the origin shifted to (without rotating the axes)

(A) (1, 2) (B) (–1, 2)

(C) (–1, –2) (D) (1, –2)

10. The equation $x^2 - y^2 = a^2$ changes to the form $xy = c^2$ if the co-ordinate axes rotates through an angle (keeping origin fixed)

(A) $\frac{\pi}{2}$ (B) $-\frac{\pi}{2}$

(C) $\frac{\pi}{4}$ (D) $\frac{\pi}{3}$

11. The centres of three circles $x^2 + y^2 - 10x + 9 = 0$, $x^2 + y^2 - 6x + 2y + 1 = 0$, $x^2 + y^2 - 9x - 4y + 2 = 0$ lie on the straight line

(A) $x - 2y = 5$ (B) $y - 2x = 5$

(C) $2y - x = 5$ (D) do not lie on a straight line

12. If the circles $(x-1)^2 + (y-3)^2 = r^2$ and $x^2 + y^2 - 8x + 2y + 8 = 0$ intersect in two distinct points, then

(A) $r < 2$ (B) $8 < r < 10$

(C) $r = 2$ (D) $2 < r < 8$

13. Four distinct points $(2k, 3k)$, (1, 0), (0, 1) and (0, 0) lie on a circle for

(A) only one value of k (B) $0 < k < 1$

(C) $k < 0$ (D) all integral values of k

14. For the parabola $y^2 + 4ax = 0$ which of the following is false?

(A) Equation of the Latus rectum is $x = -a$ (B) directrix is $x = a$

(C) Vertex is at (0, 0) (D) Focus is at $(a, 0)$

15. The angle subtended by a double ordinate of length $2a$ unit of the parabola $y^2 = ax$ at the vertex of the parabola is

(A) $\frac{\pi}{4}$ (B) $\frac{\pi}{2}$

(C) $\frac{\pi}{3}$ (D) $\frac{\pi}{6}$

16. If t_1 and t_2 are parameters of the end points of a focal chord of a parabola $y^2 = 4ax$, then

(A) $t_1 t_2 = 0$ (B) $t_1 + t_2 = -1$

(C) $t_1 t_2 = 1$ (D) $t_1 t_2 = -1$

17. A variable point P moves in such a manner that the ratio of its distance from the line $x + y = 10$ to its distance from the point $(-2, 1)$ is 2. Then the locus of P is

(A) a parabola (B) an ellipse

(C) a hyperbola (D) a straight line

18. The eccentric angle of a point in the 1st quadrant on the ellipse $x^2 + 3y^2 = 6$ at a distance of 2 unit from its centre is

(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{8}$

(C) $\frac{\pi}{4}$ (D) $\frac{\pi}{3}$

19. If e_1 and e_2 are eccentricities of the two hyperbolas $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ and $\frac{x^2}{b^2} - \frac{y^2}{a^2} = 1$, then

(A) $e_1 = e_2$ (B) $e_1 e_2 = 1$

(C) $e_1 = -e_2$ (D) $\frac{1}{e_1^2} + \frac{1}{e_2^2} = 1$

20. The eccentricity of the conic $x = \frac{a}{2}\left(e^t + e^{-t}\right)$, $y = \frac{a}{2}\left(e^t - e^{-t}\right)$; $t \in \square$ is

(A) $\sqrt{2}$ (B) $\sqrt{3}$

(C) $2\sqrt{2}$ (D) $2\sqrt{3}$

21. If $\frac{z-1}{z+1}$ is purely imaginary, then

(A) $|z|=3$ (B) $|z|=2$

(C) $|z|=1$ (D) $|z|=\frac{1}{3}$

22. The smallest positive integer n such that $(\sin\theta+i\cos\theta)^n=(\cos\theta-i\sin\theta)^n$ is

(A) 6 (B) 8

(C) 4 (D) 12

23. $\left(\frac{\sqrt{3}}{2}+i\frac{1}{2}\right)^{165}$ is equal to

(A) -1 (B) $\frac{\sqrt{3}}{2}-i\frac{1}{2}$

(C) i (D) $-i$

24. If $e^{i\alpha}=\cos\alpha+i\sin\alpha$, then for the ΔABC, $e^{iA}.e^{iB}.e^{iC}$ is equal to

(A) $-i$ (B) 1

(C) -1 (D) i

25. If A is a square matrix of order n, then $A.(\text{Adj}A)$ is equal to

(A) I (B) $|A|I$

(C) 0 (D) $|A|^n I$

26. If $\Delta=\begin{vmatrix}1&2&3\\2&-1&0\\3&4&5\end{vmatrix}$, then $\begin{vmatrix}1&6&3\\4&-6&0\\3&12&5\end{vmatrix}$ is equal to

(A) 2Δ (B) 3Δ

(C) 6Δ (D) 0

27. The sum of those values of x for which

$$\Delta = \begin{vmatrix} -x & a & b \\ b & -x & a \\ a & b & -x \end{vmatrix}$$ is zero, is

(A) -1 (B) $a+b$

(C) $a+2b$ (D) 0

28. If $A = \begin{pmatrix} 0 & \alpha \\ \beta & 0 \end{pmatrix}$, $\alpha \neq 0$, $\beta \neq 0$ then $A^3 + A = 0$ whenever

(A) $\alpha\beta = -1$ (B) $\alpha\beta = 1$

(C) $\alpha\beta = 2$ (D) $\alpha\beta = \frac{1}{2}$

29. If A is a matrix of order 3×3 and $A' = -A$, then $|A|$ is equal to

(A) -1 (B) 0

(C) 1 (D) 2

30. If A and B are square matrix of order 3, det $A = 3$, and det $B = -3$, then det $(3AB)$ will be

(A) -27 (B) -9

(C) 9 (D) -243

31. The n^{th} term of the series $1 + \frac{1+2}{2} + \frac{1+2+3}{3} + \ldots\ldots\ldots$ is

(A) $\frac{n-1}{2}$ (B) $\frac{n^2+1}{2}$

(C) $\frac{n+1}{2}$ (D) $\frac{n^2-1}{2}$

32. Let T_n be the n^{th} term of a G.P of +ve terms in which $T_4 : T_6 = 1 : 4$ and $T_2 + T_5 = 216$. The T_1 is

(A) 12 (B) 14

(C) 16 (D) 18

33. If the sum of first n natural numbers is $\frac{1}{5}$ times the sum of their squares, then $n =$

(A) 7 (B) 8

(C) 6 (D) 5

34. Let $\vec{a}$ and $\vec{b}$ be two non zero vectors such that $|\vec{a}+\vec{b}|=|\vec{a}-\vec{b}|$. Then

(A) $\vec{a} \perp \vec{b}$ (B) $\vec{a} \| \vec{b}$

(C) $|\vec{a}|=|\vec{b}|$ (D) $\vec{a}.\vec{b}=1$

35. The value of $\hat{i}.(\hat{j}\times\hat{k})+\hat{j}.(\hat{k}\times\hat{i})+\hat{k}.(\hat{i}\times\hat{j})$ is equal to

(A) 0 (B) –3

(C) –1 (D) 3

36. If $\vec{a}=3\vec{i}-\vec{j}+2\vec{k}$ and $\vec{b}=-\vec{i}-2\vec{j}+4\vec{k}$, then an unit vector along the vector $\vec{a}\times\vec{b}$ is

(A) $\frac{-2\vec{j}-\vec{k}}{\sqrt{5}}$ (B) $\frac{2\vec{j}+\vec{k}}{\sqrt{5}}$

(C) $\frac{\vec{j}-2\vec{k}}{\sqrt{5}}$ (D) $\frac{\vec{j}+2\vec{k}}{\sqrt{5}}$

37. A force of magnitude 5 units acting along the vectors $2\vec{i}-\vec{j}+2\vec{k}$ displaces the point of application from (1,1,1) to (8,3,–2). The work done is

(A) 5 units (B) 2 units

(C) 7 units (D) 10 units

38. If $A=\{x:x^2+6x-7=0\}$ and $B=\{x:x^2+9x+14=0\}$ then $A-B=$

(A) $\{1,-7\}$ (B) $\{1\}$

(C) $\{-7\}$ (D) $\{1,-2,-7\}$

39. If A, B are two non-empty sets, then $(A\backslash B)\cup(B\backslash A)$ equal to

(A) $(A\cup B)\backslash B$ (B) $A\backslash(A\cup B)$

(C) $(A\cap B)\cup(A\cup B)$ (D) $(A\cup B)\backslash(A\cap B)$

40. If A and B are subsets of X and $A \cup B = X$ then $\left[A \cap (X - B)\right] \cup B =$

(A) $A \cup B$ (B) $A \cap B$

(C) A (D) B

41. If ρ be a relation on N defined by $a \rho b$ iff $2a + b = 41$; then the domain of ρ is equal to

(A) $\{x \in N : 1 \leq x \leq 40\}$ (B) $\{x \in N : 1 \leq x \leq 4\}$

(C) $\{x \in N : 1 \leq x \leq 20\}$ (D) $\{x \in N : 1 \leq x \leq 21\}$

42. If A and B are disjoint sets, the $n(A \cup B)$ is equal to

(A) $n(A)$ (B) $n(B)$

(C) $n(A)+n(B)$ (D) $n(A).n(B)$

43. Let $\square = \{(1,3), (4,2), (2,4), (2,3), (3,1)\}$ be a relation on the set $A = \{1, 2, 3, 4\}$. The relation $\square$ is

(A) not symmetric (B) transitive

(C) symmetric (D) reflexive

44. The value of $\underset{x \to 0}{Lt} \dfrac{e^x - e^{-x} - 2x}{x - \sin x}$ is

(A) 0 (B) 1

(C) 2 (D) –1

45. $\underset{x \to 0}{Lt} \dfrac{\log(1+ax) + \log(1+bx)}{x}$ is equal to

(A) $a - b$ (B) $a + b$

(C) ab (D) $\dfrac{a}{b}$

46. If $f(x) = \log(x - 1) - \log(x-2)$ and $g(x) = \log\left(\dfrac{x-1}{x-2}\right)$ then $f(x) = g(x)$ if $x \in$

(A) $[1, 2]$ (B) $[2, \infty)$

(C) $(2, \infty)$ (D) $(-\infty, \infty)$

47. Let $\phi(x)=\dfrac{1-\cos \lambda x}{x \sin x}$, for $x \neq 0$

$=\dfrac{1}{2}$, for $x = 0$

If $\phi(x)$ is continuous at $x = 0$, then λ is equal to

(A) 0 (B) ± 1

(C) 2 (D) ∞

48. If $y=\sin^{-1}\left(3t-4t^3\right)$ and $x=\cos^{-1}\sqrt{1-t^2}$, then $\dfrac{dy}{dx}$ is equal to

(A) 2 (B) $\dfrac{5}{2}$

(C) $\dfrac{2}{3}$ (D) 3

49. If $e^x+e^y=e^{x+y}$, then $\dfrac{dy}{dx}$ at (2, 2) is

(A) 2 (B) 1

(C) -1 (D) e

50. If $y=\sin^{-1}\left[\dfrac{5x+12\sqrt{1-x^2}}{13}\right]$, then $\dfrac{dy}{dx}$ =

(A) $-\dfrac{1}{\sqrt{1-x^2}}$ (B) $\dfrac{1}{\sqrt{1-x^2}}$

(C) $\dfrac{3}{\sqrt{1-x^2}}$ (D) $\dfrac{x}{\sqrt{1-x^2}}$

51. If $y^2=4ax$, then $\dfrac{d^2y}{dx^2}.\dfrac{d^2x}{dy^2}$ is equal to

(A) 1 (B) a

(C) $-\dfrac{2a}{y^3}$ (D) $-\dfrac{a}{y^2}$

52. If $f(x)=\log\left[e^x\left(\frac{3-x}{3+x}\right)^{1/3}\right]$, then $f'(1)$ is equal to

(A) $\frac{3}{4}$ (B) $\frac{2}{3}$

(C) $\frac{1}{3}$ (D) $\frac{1}{2}$

53. If $h(x)=f(x)+f(-x)$, then $h(x)$ has got an extreme value at a point if $f'(x)$ is

(A) an even function (B) an odd function

(C) zero (D) neither even nor odd

54. If $x+y=3$; $x, y>0$ then maximum value of xy^2 is

(A) 30 (B) 4

(C) 12 (D) 1

55. $\int\frac{dx}{\sqrt{\cos^3 x \sin^5 x}}$ is equal to

(A) $2\sqrt{\tan x}+\frac{2}{3}(\tan x)^{\frac{3}{2}}+c$ (B) $2\sqrt{\tan x}-\frac{2}{3}(\tan x)^{-\frac{3}{2}}+c$

(C) $\frac{2}{3}(\tan x)^{\frac{3}{2}}-2(\tan x)^{-\frac{1}{2}}+c$ (D) $\frac{2}{3}(\tan x)^{\frac{3}{2}}+2(\tan x)^{-\frac{3}{2}}+c$

56. If $\int\frac{dx}{\sqrt{(x-1)(4-x)}}=\sin^{-1}f(x)+c$, then $f(x)$ is equal to

(A) $\frac{2x-5}{3}$ (B) $\frac{x-1}{3}$

(C) $\frac{4-x}{3}$ (D) $\frac{2x-3}{5}$

57. If $\int \frac{\cos 2x - 1}{\cos 2x + 1} dx = A \tan x + Bx + c$, then the value of A and B are

(A) $A = -1, B = 1$
(B) $A = 1, B = -1$
(C) $A = -1, B = -1$
(D) $A = 1, B = 1$

58. The value of $\int \frac{\cos 2x}{(\cos x - \sin x)^2}$ is

(A) $-\log(\cos x - \sin x) + c$
(B) $-\log|\cos x - \sin x| + c$
(C) $\log|\cos x + \sin x| + c$
(D) $-\log(\cos x + \sin x) + c$

59. The value of $\int_0^{\frac{\pi}{2}} \frac{dx}{1 + \tan^{101} x}$ is

(A) $\frac{\pi}{2}$
(B) π
(C) $\frac{\pi}{4}$
(D) 0

60. The value of $\int_1^{\sqrt{e}} x \log x \, dx$ is

(A) $\frac{1}{2}$
(B) $\frac{1}{3}$
(C) $\frac{1}{4}$
(D) $\frac{1}{5}$

61. The value of $\lim_{n \to \infty} \frac{\sqrt{1} + \sqrt{2} + \ldots\ldots + \sqrt{n}}{n^{3/2}}$ is equal to

(A) 0
(B) $2/3$
(C) 1
(D) $3/2$

62. The order and degree of the differential equation $\left(\frac{d^2y}{dx^3}\right)^2 + y = \sqrt[3]{1+\frac{dy}{dx}}$ are respectively

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

(C) 2, 3 (D) 3, 6

63. The differential equation of the family of curves $y = ae^{bx}$ where a and b are parameters is

(A) $yy_1 = y_2^2$ (B) $yy_1^2 = y_2$

(C) $yy_2 = y_1^2$ (D) $yy_2^2 = y$

64. The solution of $\frac{dy}{dx} = e^{y+x} + e^{y-x}$ is

(A) $e^{-y} = e^{-x} - e^{x} + c$ (B) $e^{-y} = e^{x} - e^{-x} + c$

(C) $e^{-y} = e^{-x} + e^{x} + c$ (D) $e^{-y} = e^{x} + e^{-x} + c$

65. General solution of the differential equation $y(1+x)\,dx + x(1+y)\,dy = 0$ is

(A) $x + y - \log\left|\frac{x}{y}\right| = C$ (B) $x + y + \log|xy| = C$

(C) $x + y - \log|xy| = C$ (D) $x + y + \log|xy| = 0$

where C is an arbitrary constant.

66. If the integrating factor of $x(1-x^2)\,dy + (2x^2y - y - ax^3)\,dx = 0$ is $e^{\int P dx}$, then P is equal to

(A) $\frac{2x^2 - ax^3}{x(1-x^2)}$ (B) $\frac{2x^2 - 1}{x(1-x^2)}$

(C) $2x^3 - 1$ (D) $\frac{2x^2 - 1}{ax^3}$

67. If ${}^{n}P_5 = 60.{}^{n-1}P_3$, then n is

(A) 6 (B) 15
(C) 10 (D) 12

68. 3 books on Relativity, 5 books on Cosmology and 4 books on Black holes are placed on a Shelf so that the books on the same subject are always together. The possible number of way is equal to

(A) $\underline{|3} \times \underline{|5} \times \underline{|4}$ (B) $\underline{|10}$
(C) $(\underline{|3})^2 \times \underline{|5} \times \underline{|4}$ (D) $\underline{|2} \times \underline{|3} \times \underline{|5}$

69. Total number of four digited odd numbers that can be formed by using 0, 1, 2, 3, 5, 7 are

(A) 216 (B) 375
(C) 400 (D) 720

70. A polygon has 44 diagonals. The number of its sides is

(A) 8 (B) 10
(C) 12 (D) 11

71. The maximum number of points into which 5 circles and 5 straight lines intersects is

(A) 50 (B) 75
(C) 80 (D) 40

72. Let T_n denotes the number of triangles which can be formed by joining the vertices of a polygon of n sides. If $T_n - T_{n-1} = 21$, then the value of n is

(A) 5 (B) 6
(C) 7 (D) 8

73. What is the chance that a leap year, selected at random, will contain 53 Sundays?

(A) $\frac{1}{53}$ (B) $\frac{2}{53}$
(C) $\frac{1}{7}$ (D) $\frac{2}{7}$

74. The probability of three mutually exclusive events A, B and C are $\frac{2}{3}, \frac{1}{4}$ and $\frac{1}{6}$ respectively. The above statement is

(A) true
(B) wrong
(C) could be either
(D) do not know

75. In a single throw of a pair of dice P (sum > 12) is equal to

(A) $\frac{1}{8}$
(B) 1
(C) 0.89
(D) 0

76. Two cards are drawn at random from a pack of 52 cards. The probability of these being queens is

(A) $\frac{1}{26}$
(B) $\frac{1}{2}$
(C) $\frac{1}{221}$
(D) $\frac{1}{220}$

77. Let A and B be two events such that $P(A)=0.3$ and $P(A \cup B)=0.8$. If A and B are independent events, then $P(B)=$

(A) $\frac{1}{10}$
(B) $\frac{1}{5}$
(C) $\frac{1}{2}$
(D) $\frac{5}{7}$

78. The probability distribution of a random variable X is given below:

$X=n$	-1	0	1
$P(X)$	$6b$	$4b$	$2b$

Then the value of b is

(A) $\frac{1}{12}$
(B) $\frac{1}{6}$
(C) $\frac{1}{4}$
(D) $\frac{1}{2}$

79. If the mean of a Binomial distribution is 3 and its variance is $\frac{3}{2}$, then the number of trial is

(A) 6 (B) 8
(C) 12 (D) 16

80. The mean of a set of numbers is $\bar{x}$. If each number is increased by λ, the mean of the new set is

(A) $\bar{x}$ (B) $\bar{x}+\lambda$
(C) $\lambda\bar{x}$ (D) $\bar{x}-\lambda$

81. If the mode of a set of data is 18 and the mean is 24, then median is

(A) 18 (B) 24
(C) 22 (D) 21

82. If mean = (3 × median – mode) k, then the value of k is

(A) 1 (B) 2
(C) $\frac{1}{2}$ (D) $\frac{3}{2}$

83. If r is the correlation coefficient, then

(A) $r \geq 1$ (B) $r \leq 1$
(C) $|r| \leq 1$ (D) $|r| \geq 1$

84. If $y = a + bx$ where a and b are constants and the standard deviation of x and y are σ_x and σ_y respectively, then

(A) $\sigma_y = a + b\sigma_x$ (B) $\sigma_y = a\sigma_x + b$
(C) $\sigma_y = |b|\sigma_x$ (D) $\sigma_x = \sigma_y$

85. The standard deviation of 5 scores 1, 2, 3, 4, 5 is

(A) $\frac{2}{5}$ (B) $\frac{3}{5}$
(C) $\sqrt{2}$ (D) $\sqrt{3}$

86. The coefficient of correlation between x and y is 0.6. Their covariance is 4.8, variance of $x = 9$. Then $\sigma_y =$

(A) $\frac{8}{3}$ (B) $\frac{3}{8}$

(C) $\frac{8}{9}$ (D) $\frac{9}{8}$

87. If $z = \log\left(x + \sqrt{x^2 + y^2}\right)$, then $e^z \frac{\partial z}{\partial y}$ is

(A) $\frac{\partial z}{\partial x}$ (B) $y\frac{\partial z}{\partial x}$

(C) $z\frac{\partial z}{\partial x}$ (D) $x\frac{\partial z}{\partial x}$

88. If $u = \sin^{-1}\left(\frac{x}{y}\right) + \tan^{-1}\left(\frac{y}{x}\right)$, then $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} =$

(A) 0 (B) 1

(C) 2 (D) 3

89. If $u = f(y - z, z - x, x - y)$ then $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} =$

(A) $\frac{\partial f}{\partial x} + \frac{\partial f}{\partial y} + \frac{\partial f}{\partial z}$ (B) 0

(C) 3 (D) $f(y - z, z - x, x - y)$

90. If $u = e^{-x^2 - y^2}$ then

(A) $xu_x = yu_y$ (B) $yu_x = xu_y$

(C) $yu_x + xu_y = 0$ (D) $x^2u_y + y^2u_x = 0$

91. If x is a positive integer then $\left(1+i\sqrt{3}\right)^n+\left(1-i\sqrt{3}\right)^n$ is equal to

(A) $2^{n+1}\cos\frac{n\pi}{3}$ (B) $\cos\frac{n\pi}{3}$

(C) $2^{n+1}\cos\frac{n\pi}{6}$ (D) $\cos\frac{n\pi}{6}$

92. The number of tangents to the parabola $y^2=4ax\ (a>0)$ from the point (1, 0) is

(A) 3 (B) 2

(C) 1 (D) 0

93. The eccentricity of an ellipse whose pair of conjugate diameters are $y=x$ and $3y=-2x$ is

(A) $\frac{2}{3}$ (B) $\frac{1}{3}$

(C) $\frac{1}{\sqrt{3}}$ (D) $\frac{1}{\sqrt{2}}$

94. Let $f(x)=x^2+4x+1$. Then

(A) $f(x)>0$, for all x (B) $f(x)>1$, when $x\geq 0$

(C) $f(x)\geq 1$, when $x\leq -4$ (D) $f(x)=f(-x)$, for $\forall x$

95. If a matrix A is symmetric as well as skew symmetric, then

(A) A is a diagonal matrix (B) A is a null matrix

(C) A is a unit matrix (D) A is a triangular matrix

96. If the capital letters denote the cofactor of the corresponding small letters in $\Delta=\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}$. Then the value of $\Delta'=\begin{vmatrix} A_1 & B_1 & C_1 \\ A_2 & B_2 & C_2 \\ A_3 & B_3 & C_3 \end{vmatrix}$ is

(A) Δ (B) Δ^2

(C) 2Δ (D) 0

97. If $\bar{a}, \bar{b}, \bar{c}$ are non-zero coplaner vectors, then $\left[2\bar{a}-\bar{b}\ 3\bar{b}-\bar{c}\ 4\bar{c}-\bar{a}\right]=$

(A) 9 (B) 27

(C) 0 (D) 25

98. The length of subtangent at $x=\frac{\pi}{2}$ on the curve $y=x\sin x$ is

(A) 0 (B) 1

(C) $\frac{\pi}{2}$ (D) π

99. If $I_n=\int_0^{\frac{\pi}{4}}\tan^n\theta\, d\theta$, for n = 1, 2, 3, ...

Then $I_{n-1}+I_{n+1}=$

(A) 0 (B) 1

(C) $\frac{1}{n+1}$ (D) $\frac{1}{n}$

100. If $y=\left(\sin^{-1}x\right)^2$, then $\left(1-x^2\right)\frac{d^2y}{dx^2}-x\frac{dy}{dx}$ is equal to

(A) 1 (B) –1

(C) 2 (D) –2

Space for Rough Work

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নির্দেশাবলি

পরীক্ষার্থীদের উত্তর দেওয়ার পূর্বে নির্দেশাবলি ভালো করে পড়ে নিতে হবে ঃ

১। এই প্রশ্নপত্রে 100টি MCQ ধরনের প্রশ্ন দেওয়া আছে। প্রতিটি প্রশ্নের A, B, C এবং D এই চারটি সম্ভাব্য উত্তর দেওয়া আছে।

২। সঠিক উত্তর দিলে 1 নম্বর পাবে। ভুল উত্তর দিলে অথবা যে কোনো প্রশ্নের একাধিক উত্তর দিলে –¼ নম্বর পাবে। কোনো উত্তর না দিলে শূন্য পাবে।

৩। OMR পত্রে A, B, C অথবা D চিহ্নিত সঠিক ঘরটি ভরাট করে উত্তর দিতে হবে।

৪। OMR পত্রে উত্তর দিতে শুধুমাত্র কালো/নীল বল পয়েন্ট পেন ব্যবহার করবে।

৫। OMR পত্রে নির্দিষ্ট স্থান ছাড়া অন্য কোথাও কোনো দাগ দেবে না।

৬। OMR পত্রে নির্দিষ্ট স্থানে প্রশ্নপত্রের নম্বর এবং নিজের রোল নম্বর অতি সাবধানতার সাথে লিখতে হবে এবং প্রয়োজনীয় ঘরগুলি পূরণ করতে হবে।

৭। OMR পত্রে নির্দিষ্ট স্থানে নিজের নাম ও পরীক্ষাকেন্দ্রের নাম লিখতে হবে এবং নিজের সম্পূর্ণ স্বাক্ষর দিতে হবে।

৮। OMR উত্তরপত্রটি ইলেকট্রনিক যন্ত্রের সাহায্যে পড়া হবে। সুতরাং, প্রশ্নপত্রের নম্বর বা রোল নম্বর ভুল লিখলে অথবা ভুল ঘর ভরাট করলে উত্তরপত্রটি অনিবার্য কারণে বাতিল হতে পারে। এছাড়া পরীক্ষার্থীর নাম, পরীক্ষাকেন্দ্রের নাম বা স্বাক্ষরে কোনো ভুল থাকলেও পত্র বাতিল হয়ে যেতে পারে। OMR উত্তরপত্রটি ভাঁজ হলে বা তাতে অনাবশ্যক দাগ পড়লেও বাতিল হয়ে যেতে পারে। পরীক্ষার্থীর এই ধরনের ভুল বা অসতর্কতার জন্য উত্তরপত্র বাতিল হলে একমাত্র পরীক্ষার্থী নিজেই তার জন্য দায়ী থাকবে।

৯। প্রশ্নপত্রে রাফ কাজ করার জন্য ফাঁকা জায়গা দেওয়া আছে। অন্য কোনো কাগজ এই কাজে ব্যবহার করবে না।

১০। পরীক্ষাকক্ষ ছাড়ার আগে OMR পত্র অবশ্যই পরিদর্শককে দিয়ে যাবে।