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Previous Year Paper
(Mathematics)
09 Sept, 2023 Shift 1

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MA2

Test Booklet Series **0**

← Question Booklet Number

Number of Pages in Booklet
24

No. of Questions in Booklet
100

Maximum Marks
100

Time **2** Hours

Please read the instructions given below carefully and follow them.

Do not open this test booklet until you are asked to do so.

INSTRUCTIONS

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET DOES ***NOT*** HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS, ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.
2. Please note that it is the candidate's responsibility to encode and darken the **ROLL NUMBER, TEST BOOKLET SERIES** Code A, B, C or D and Question Booklet Number carefully and without any omission or discrepancy at the appropriate places in the OMR Answer Sheet. **Any omission/discrepancy will render the OMR Answer Sheet liable for rejection.**
3. You have to enter your Roll Number on the Test Booklet in the Box provided below. ***DO NOT*** write ***anything else*** on the Test Booklet.

4. This Test Booklet contains 100 items (questions). Each item shall have five options (A, B, C, D, and E). If a candidate is attempting a question, he has to darken most appropriate circle from A, B, C or D. However if you are not attempting a question then you have to darken the circle 'E'. If none of the five circle is darkened, one-fourth (0.25) marks shall be deducted.
5. **Any candidate not darkening any of the five circles in more than 10% question shall be disqualified.**
6. **All questions are compulsory. Each question carry one mark. For each wrong Answer, one fourth (0.25) mark shall be deducted.**
7. You have to mark all your responses ***ONLY*** on the separate OMR Answer Sheet provided. See directions in the OMR Answer Sheet. Use only **BLUE/BLACK Ball Point Pen** to answer in OMR Answer Sheet.
8. Before you proceed to mark in the OMR Answer Sheet the response to various items in the Test Booklet, you have to fill in some particulars in the OMR Answer Sheet as per instructions mentioned on the OMR Answer Sheet.
9. At the end of the examination you should handover to the invigilator the original copy and office copy of the OMR Sheet. You are permitted to take away with you the Question Booklet along with candidate's copy of the OMR Sheet.
10. Sheets for rough work are appended in the Test Booklet at the end.

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1 Let A and B be two sets containing 2 and 4 elements respectively. Then the number of subsets of $A \times B$ having 3 or more elements is equal to :

(A) 219
(B) 210
(C) 200
(D) 248
(E) Question not attempted

2 If $f(x+2y, x-2y) = xy$, then $f(x,y)$ is equal to :

(A) $\frac{x^2+y^2}{4}$
(B) $\frac{x^2-y^2}{4}$
(C) $\frac{x^2-y^2}{8}$
(D) $\frac{x^2+y^2}{8}$
(E) Question not attempted

3 If $g(x) = x^2 - 6x + 38$, and $(gof)(x) = 4x^2 - 10x + 5$, then $f(4)$ is equal to :

(A) 2
(B) 3
(C) 4
(D) 5
(E) Question not attempted

4 Consider the statement: $P(n) = n^2 - n + 41$ is prime. Then which one of the following is TRUE ?

(A) (5) is false but $P(3)$ is true
(B) (3) is false but $P(5)$ is true
(C) Both $P(5)$ and $P(3)$ are true
(D) Both $P(5)$ and $P(3)$ are false
(E) Question not attempted

5 The coefficient of x^7 in $(1+x)^{10} + x(1+x)^9 + x^2(1+x)^8 + \ldots + x^{10}$ is :

(A) 110
(B) 220
(C) 330
(D) 440
(E) Question not attempted

6 If $\frac{Z-\alpha}{Z+\alpha}$ is a purely imaginary number with $\alpha \in \mathbb{R}$ and $|z| = 4$, then the value of α is :

(A) 1
(B) 2
(C) 3
(D) 4
(E) Question not attempted

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7 If a, b, c, d are positive real numbers such that $a + b + c + d = 2$, then $M = (a + b)(c + d)$ satisfies :

(A) $0 \le M \le 1$
(B) $1 \le M \le 2$
(C) $2 \le M \le 3$
(D) $-1 \le M \le 0$
(E) Question not attempted

8 If binomial coefficient of three consecutive terms of $(1+x)^n$ are in H.P., then the maximum possible value of n is :

(A) 10
(B) 20
(C) 30
(D) None of these
(E) Question not attempted

9 The harmonic mean of two numbers is 4, their arithmetic mean A and geometric mean G satisfy the relation $2A + G^2 = 27$, then the numbers are :

(A) 4 and 4
(B) 8 and 8/3
(C) 3 and 6
(D) 5 and 10/3
(E) Question not attempted

10 Let $\cos\theta = x + \frac{p}{x'}$ where x is a real number for all real values of θ, then :

(A) $p \ge \frac{1}{4}$
(B) $\frac{1}{2} \ge p \ge \frac{1}{4}$
(C) $p \le \frac{1}{4}$
(D) $p \ge \frac{1}{2}$
(E) Question not attempted

11 If the straight line, $2x - 3y + 17 = 0$ is perpendicular to the line passing through the point (7, 17) and (15, a), then a is equal to :

(A) -5
(B) $\frac{35}{3}$
(C) $-\frac{35}{3}$
(D) 5
(E) Question not attempted

12 The two circles $x^2 + y^2 = ax$ and $x^2 + y^2 = c^2$, $(c > 0)$ touch each other if :

(A) $|a| = c$
(B) $|a| = 2c$
(C) $2|a| = c$
(D) $|a| = 3c$
(E) Question not attempted

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13 A tangent is drawn to the parabola $y^2 = 6x$ which is perpendicular to the line $2x + y = 1$. Which of the following points does not lie on it?

(A) (3, 1) (B) (4, 5)
(C) (0, 3) (D) (2, 4)
(E) Question not attempted

14 The equation of a common tangent to the parabolas $y = x^2$ and $y = -(x-2)^2$ is :

(A) $y = 4(x-2)$ (B) $y = 4(x-1)$
(C) $y = 4(x+2)$ (D) $y = 4(x+1)$
(E) Question not attempted

15 The general solution of $\sin^2\theta\sec\theta + \sqrt{3}\tan\theta = 0$ is :

(A) $\theta = \frac{n\pi}{2}, n \in I$ (B) $\theta = n\pi, n \in I$

(C) $\theta = n\pi + \frac{(-1)^{n+1}\pi}{3}, \theta = n\pi, n \in I$ (D) $\theta = n\pi + \frac{(-1)^{n+1}\pi}{3}, \ n \in I$

(E) Question not attempted

16 The value of

$$\sum_{n=1}^{3} \tan^{-1}\frac{1}{n}$$

is equal to :

(A) 0 (B) π

(C) $\frac{\pi}{2}$ (D) 2π

(E) Question not attempted

17 $\lim_{x\to 0}\left(\frac{3x^2+2}{7x^2+2}\right)^{\frac{1}{x^2}}$ is equal to :

(A) e (B) e^2

(C) $\frac{1}{e}$ (D) $\frac{1}{e^2}$

(E) Question not attempted

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18 The function $f(x)=\frac{x}{2}+\frac{2}{x}$ has a local minimum at x equal to :

(A) –1
(B) 1
(C) 2
(D) –2
(E) Question not attempted

19 If $\int_1^2 \frac{dx}{\left(x^2-2x+4\right)^{\frac{3}{2}}}=\frac{k}{x+5}$, then k is equal to :

(A) 1
(B) 2
(C) 3
(D) 4
(E) Question not attempted

20 The solution of the equation

$x\frac{dy}{dx}=y\left(\log_e y-\log_e x+1\right)$ is :

(A) $\log_e \frac{x}{y}=cy$
(B) $\log_e \frac{y}{x}=cy$
(C) $\log_e \frac{y}{x}=cx$
(D) $\log_e \frac{x}{y}=cx$
(E) Question not attempted

21 The differential equation of all parabolas, whose axes are parallel to the y-axis, is :

(A) $\frac{d^3y}{dx^3}=1$
(B) $\frac{d^3y}{dx^3}=-1$
(C) $\frac{d^3y}{dx^3}=0$
(D) None of these
(E) Question not attempted

22 If a, b, c are unit vectors such that $a.b = a.c = 0$ and the angle between b and c is $\frac{\pi}{6}$, then the value of $|a \times b - a \times c|$ is :

(A) 0
(B) 1
(C) $\sqrt{2}$
(D) $\sqrt{2-\sqrt{3}}$
(E) Question not attempted

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23 If the planes $x - cy - bz = 0$, $cx - y + az = 0$ and $bx + ay - z = 0$ pass through a line, then the value of $a^2 + b^2 + c^2$ is :

(A) $1 - 2abc$
(B) 1
(C) $2\ abc$
(D) abc
(E) Question not attempted

24 If the mean of square of first n natural numbers is 105, then the median of first n natural numbers is :

(A) 7
(B) 8
(C) 9
(D) 10
(E) Question not attempted

25 If $\frac{1-3p}{2}, \frac{1+4p}{3}, \frac{1+p}{6}$ are the probabilities of three mutually exclusive and exhaustive events then the set of all possible values p is :

(A) $[0, 1]$
(B) $\left[-\frac{1}{4}, \frac{1}{3}\right]$
(C) $\left[0, \frac{1}{3}\right]$
(D) $(0, 1)$
(E) Question not attempted

26 The minimal polynomial associated with the matrix $\begin{bmatrix} 0 & 0 & 3 \\ 1 & 0 & 2 \\ 0 & 1 & 1 \end{bmatrix}$ is :

(A) $x^3 - x^2 - 2x - 3$
(B) $x^3 - x^2 + 2x - 3$
(C) $x^3 - x^2 - 3x - 3$
(D) $x^3 - x^2 + 3x - 3$
(E) Question not attempted

27 For the function $f(z) = \sin\left(\frac{1}{\cos(1/z)}\right)$, the point $z = 0$ is :

(A) a removable singularity
(B) a pole
(C) an essential singularity
(D) a non-isolated singularity
(E) Question not attempted

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28 A computer company needs 25 programmers to handle systems programming jobs and 40 programmers for application programming. Of those hired, 10 will be expected to handle both types of jobs. How many programmers the company must hire ?

(A) 45
(B) 55
(C) 65
(D) 75
(E) Question not attempted

29 Let $A = \{ a_1, a_2, a_3 \}$ and $B = \{ b_1, b_2, b_3 \}$. Consider the function $f = \{(a_1, b_2), (a_2, b_3), (a_3, b_1)\}$. Then :

(A) f is both one to one and onto
(B) f is not one to one but onto
(C) f is one to one but not onto
(D) f is neither one to one nor onto
(E) Question not attempted

30 Let $P(n)$ be the statement $2 \mid (2n + 1)$. Then :

(A) $P(n)$ is true for every integer n.
(B) $P(n)$ is true for $n = 10$.
(C) $P(n)$ is true for every integer n except 10.
(D) $P(n)$ is true implies that $P(n + 1)$ is true for every integer n.
(E) Question not attempted

31 The number of seven person committees consisting of 3 women and 4 men that can be formed from a group of 20 women and 30 men, is :

(A) 312417
(B) 3124170
(C) 31241700
(D) 312417000
(E) Question not attempted

32 The complex number $\frac{2-7i}{8+3i}$ is equal to :

(A) $-\frac{5}{73}-\frac{62}{73}i$
(B) $-\frac{5}{73}+\frac{62}{73}i$
(C) $+\frac{5}{73}+\frac{62}{73}i$
(D) $\frac{5}{73}-\frac{62}{73}i$
(E) Question not attempted

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33 If $-5x + 19 \leq -11$, then :

(A) $x \in (-\infty, -6)$

(B) $x \in (-\infty, 6)$

(C) $x \in (6, \infty)$

(D) $x \in [6, \infty)$

(E) Question not attempted

34 The coefficient of the middle term in the expansion of $(2x - 7)^4$ is :

(A) 168

(B) 216

(C) 432

(D) 1176

(E) Question not attempted

35 The geometric series $1 + x + x^2 + x^3 + ...$ is convergent to $1/(1 - x)$ in the interval :

(A) $x > 1$

(B) $x < 1$

(C) $|x| > 1$

(D) $|x| < 1$

(E) Question not attempted

36 For a natural number, let $\varphi(n)$ denote the number of positive integers $\leq n$ which are coprime to n. The value of $\varphi(60)$ is :

(A) 7

(B) 10

(C) 13

(D) 16

(E) Question not attempted

37 One root of the quadratic equation $4x^2 - kx - 5 = 0$ is known to be $\frac{1}{2}$. The value of k is :

(A) -2

(B) -5

(C) -7

(D) -8

(E) Question not attempted

38 Let A be the matrix $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$. Then A^3 is equal to :

(A) $20A - 8I$

(B) $20A + 8I$

(C) $8A - 20I$

(D) $8A + 20I$

(E) Question not attempted

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39 If a vertex of a triangle is at (1, 1) and the mid points of two sides through this vertex are (–1,2) and (3, –2), the centroid of the triangle is :

(A) (–1, 7)
(B) (–1/3, 7/3)
(C) (1, 7/3)
(D) (1, –3/7)
(E) Question not attempted

40 The value of tan 1° tan 3° tan 5°….tan 89° is :

(A) 0
(B) 1
(C) 2
(D) 3
(E) Question not attempted

41 The domain of $\sin^{-1}\frac{2x}{3}$ is :

(A) $\left[-\frac{2}{3},\frac{2}{3}\right]$
(B) $\left[-\frac{2}{3},\frac{3}{2}\right]$
(C) $\left[-\frac{3}{2},\frac{3}{2}\right]$
(D) [–1, 1]
(E) Question not attempted

42 The value of $\frac{dy}{dx}$ if $y=\tan(5-\sin 2x)$ is equal to :

(A) $-2(\cos 2x)\sec^2(5-\sin 2x)$
(B) $-2\sec^2(5-\sin 2x)$
(C) $(\cos 2x)\sec^2(5-\sin 2x)$
(D) $-2(\cos 2x)\tan(5-\sin 2x)$
(E) Question not attempted

43 Let $f(x)=x^2$. Then by mean value theorem, there exists a point c in the interval [0,2] where $\frac{df}{dx}$ is equal to :

(A) 0
(B) 1
(C) 2
(D) 3
(E) Question not attempted

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44 The value of $\int \sin^2 x\, dx$ is equal to :

(A) $\frac{x}{2}+\frac{\sin 2x}{4}+C$

(B) $\frac{x}{2}-\frac{\sin 2x}{4}+C$

(C) $\frac{x}{4}+\frac{\sin 2x}{2}+C$

(D) $\frac{x}{4}-\frac{\sin 2x}{2}+C$

(E) Question not attempted

45 The area of the region between the curve $y = 4 - x^2$, $0 \le x \le 3$ and the x-axis is equal to :

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

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

(C) $\frac{16}{3}$

(D) $\frac{32}{3}$

(E) Question not attempted

46 If θ is the angle between the vectors $\vec{a}$ and $\vec{b}$, such that $|\vec{a}\times\vec{b}| = |\vec{a}\cdot\vec{b}|$, then θ is equal to :

(A) 0°

(B) 45°

(C) 120°

(D) 180°

(E) Question not attempted

47 The coordinates of the point of intersection of the line $\frac{x+1}{1}=\frac{y+3}{3}=\frac{z+2}{-2}$ with the plane $3x + 4y + 5z = 5$ is :

(A) (5, 15, –14)

(B) (1, 3, –2)

(C) (3, 4, 5)

(D) (3, 12, –10)

(E) Question not attempted

48 Section of a sphere by a plane is a :

(A) parabola

(B) circle

(C) cone

(D) ellipse

(E) Question not attempted

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49 Consider a dice with the property that probability of a face with n dots showing up is proportional to n. The probability of face showing 4 dots is :

(A) 1/7
(B) 5/42
(C) 1/21
(D) 4/21
(E) Question not attempted

50 Four coins are tossed. Two of them fall within the view of an observer who sees that both are heads. What is the probability to this observer that exactly three of the four coins come up heads ?

(A) 4/11
(B) 1/4
(C) 2/11
(D) 4/21
(E) Question not attempted

51 The probability of guessing the correct answer to a certain test question is $\frac{x}{12}$. If the probability of not guessing the correct answer to this question is $\frac{2}{3}$, then x is equal to :

(A) 2
(B) 3
(C) 4
(D) 6
(E) Question not attempted

52 Let $L : R^2 \to R^2$ be the linear transformation such that $L(1, 1) = (1, -2)$, $L(-1, 1) = (2, 3)$. Then $L(-1, 5)$ is equal to :

(A) (2, 3)
(B) (2, –4)
(C) (6, 9)
(D) (8, 5)
(E) Question not attempted

53 An eigen value and corresponding eigen vector of the matrix $\begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$, respectively are :

(A) 6, (1, 4)
(B) 1, (4, 4)
(C) 6, (–1, 1)
(D) 1, (1, -1)
(E) Question not attempted

54 Laplace Transform of $e^{2t} \sin t$ is equal to :

(A) $\frac{1}{s^2 - 4s + 5}$
(B) $\frac{1}{s^2 - s + 5}$
(C) $\frac{1}{s^2 - 5s + 1}$
(D) $\frac{1}{s^2 + 5s + 4}$
(E) Question not attempted

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55 The number of local extreme values of $f(x, y) = y^2 - x^2$, is :

(A) 0 (B) 1

(C) 3 (D) 5

(E) Question not attempted

56 $\int_0^2 \int_0^x (x+y)\,dy\,dx$ is equal to :

(A) 1 (B) 2

(C) 3 (D) 4

(E) Question not attempted

57 Number of elements in power set of empty set :

(A) 1 (B) 2

(C) 3 (D) empty set

(E) Question not attempted

58 Suppose $X = \{a, b, c, d\}$ and $\Re$ is a relation on X.

If $\Re = \{(a,a), (b,b), (d,d), (a,b), (b,a), (b,d), (d,b)\}$ then :

(A) $\Re$ is an equivalence relation.

(B) $\Re$ is symmetric, but not reflexive.

(C) $\Re$ is transitive, but not symmetric and reflexive.

(D) $\Re$ is reflexive, but not transitive and symmetric.

(E) Question not attempted

59 The number of distinct permutations that can be formed from the letter SOCIOLOGICAL :

(A) $\frac{12!}{2!3!}$ (B) $\frac{12!}{2!2!3!}$

(C) $\frac{12!}{2!2!2!}$ (D) $\frac{12!}{2!2!2!3!}$

(E) Question not attempted

60 The correct polar form of the complex number $1 - i$ is :

(A) $\sqrt{2}\, e^{\frac{\pi}{4}i}$ (B) $e^{\frac{-\pi}{4}i}$

(C) $\sqrt{2}\, e^{\frac{-\pi}{4}i}$ (D) $e^{\frac{\pi}{4}i}$

(E) Question not attempted

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61 Ratio of 5th term from the beginning to the 5th term from the end in the Binomial expansion of $\left(2^{1/3}+\frac{1}{2(3)^{1/3}}\right)^{10}$ is :

(A) $1 : 2(6)^{1/3}$
(B) $1 : 4(36)^{1/3}$
(C) $4(36)^{1/3} : 1$
(D) $2(36)^{1/3} : 1$
(E) Question not attempted

62 The remainder when 2^{50} is divided by 7 is :

(A) 1
(B) 4
(C) 7
(D) 9
(E) Question not attempted

63 The number of solutions of $3x \equiv 5(mod 7)$ is/are :

(A) 3
(B) 2
(C) 1
(D) 4
(E) Question not attempted

64 What is the smallest positive integer in the set $\{ 12x + 30y + 3000z \mid x, y, z \in \mathbb{Z} \}$?

(A) 2
(B) 3
(C) 9
(D) 6
(E) Question not attempted

65 The product of the roots of the equation $6x^2 - 5|x| + 1 = 0$ is :

(A) $\frac{1}{6}$
(B) $\frac{1}{36}$
(C) $\frac{1}{12}$
(D) $\frac{1}{24}$
(E) Question not attempted

66 If $a + b + c + x = 0$, then the determinant of the matrix $\begin{vmatrix} c & x & a & b \\ x & a & b & c \\ a & b & c & x \\ b & c & x & a \end{vmatrix}$, is :

(A) 0
(B) 1
(C) 2
(D) 10
(E) Question not attempted

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67 Which of the following is a subspace of the vector space $\mathbb{R}^3$?

(A) $\{(x, y.z) \mid x + y = 0\}$
(B) $\{(x, y.z) \mid x + y = 1\}$
(C) $\{(x, y.z) \mid x - y = 1\}$
(D) $\{(x, y.z) \mid x - y = 2\}$
(E) Question not attempted

68 Which of the following is NOT diagonalisable over $\mathbb{R}$?

(A) $\begin{pmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{pmatrix}$
(B) $\begin{pmatrix} 0 & 1 & 0 \\ -1 & 0 & 0 \\ 0 & 0 & 2 \end{pmatrix}$
(C) $\begin{pmatrix} 2 & -3 & 0 \\ -5 & 4 & 0 \\ 0 & 0 & 1 \end{pmatrix}$
(D) $\begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}$
(E) Question not attempted

69 The value of $\sin^{-1}\left(\frac{3}{5}\right) + \tan^{-1}\left(\frac{1}{7}\right)$:

(A) 0
(B) $\frac{\pi}{4}$
(C) $\frac{\pi}{3}$
(D) $\frac{\pi}{2}$
(E) Question not attempted

70 The angle between the lines $y - \sqrt{3}x - 5 = 0$ and $\sqrt{3}y - x + 6 = 0$ is :

(A) 120°
(B) 30°
(C) 60°
(D) 90°
(E) Question not attempted

71 The equation of tangent at the point (0, 2) to the circle $x^2 + y^2 - 4x + 2y - 8 = 0$ is :

(A) $3y - 2x = 2$
(B) $3y + 2x = 2$
(C) $3y + 2x = 6$
(D) $3y - 2x = 6$
(E) Question not attempted

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72 Differential equation of the curve $y = cx + \frac{1}{c}$ is :

(A) $xy'^2 - yy' + 1 = 0$

(B) $xy'^2 - yy' + 2 = 0$

(C) $xy'^2 + 4 = 0$

(D) $xy'^2 - 4 = 0$

(E) Question not attempted

73 If the integrating factor of $\left(x^7y^2 + 3y\right)dx + \left(3x^8y - x\right)dy = 0$ is $x^m y^n$, then :

(A) $m = -7,\ n = 1$

(B) $m = 1,\ n = -7$

(C) $m = n = 0$

(D) $m = n = 1$

(E) Question not attempted

74 The maximum number of linearly independent solutions of $\frac{d^4y}{dx^4} = 0,\ y(0) = 1$, is :

(A) 1

(B) 2

(C) 3

(D) 4

(E) Question not attempted

75 Which of the following is NOT an indeterminate form ?

(A) 1^∞

(B) 0°

(C) ∞°

(D) 0^∞

(E) Question not attempted

76 The set of points where $f(x) = |2\ \sin x\ \cos x|$ is not differentiable is :

(A) Empty set

(B) $\{0\}$

(C) $\{k\pi \mid k \in \mathbb{Z}\}$

(D) $\left\{\frac{k\pi}{z} \mid k \in \mathbb{Z}\right\}$

(E) Question not attempted

77 If all the natural number between 1 and 20 are multiplied by 4 then what is the variance of the resulting series ?

(A) 133

(B) 532

(C) 1596

(D) 235

(E) Question not attempted

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78 In Binomial distribution, the mean is $\frac{2}{3}$ and variance is $\frac{5}{9}$. What is the probability that random variable $X = 2$?

(A) $\frac{5}{36}$

(B) $\frac{25}{36}$

(C) $\frac{25}{54}$

(D) $\frac{25}{216}$

(E) Question not attempted

79 If $f(x)$ is continuous on [0,1]. Let $F(x) = \int_0^x f(x)\,dx \ \forall x \in [0,1]$, then which of the following is false ?

(A) $F'(x)$ is not Riemann integrable.

(B) $F'(x)$ is continuous.

(C) $F'(x)$ is uniformly continuous.

(D) $f(x)$ is Lebesgue integrable.

(E) Question not attempted

80 Which of the following is correct ?

(A) If $f(z)$ is analytic function, then it satisfies Cauchy-Riemann equations.

(B) If $f(z)$ satisfies Cauchy-Riemann equations then $f(z)$ is analytic.

(C) If $f(z)$ is analytic in complex plane C then $u_x = -v_y$, $u_y = -v_x$

(D) If $f(z)$ is differentiable for some points in domain D, then $f(z)$ is analytic in domain D.

(E) Question not attempted

81 If $\frac{(\sqrt{11})^n \times (121)^{1/3} \times (11)^{1/3}}{11 \times (1331)^{3/2}} = (11)^3$, then find the value of 'n'.

(A) 11

(B) 13

(C) 15

(D) 17

(E) Question not attempted

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82 If one cubic cm of water weighs one gm and one cubic cm cube of wood weighs 0.42 gm, then what is the difference in weight of 1 cubic meter of water and 1 cubic meter of wood?

(A) 560 kg
(B) 570 kg
(C) 580 kg
(D) 600 kg
(E) Question not attempted

83 In applying for admissions to a certain university the students opted for different streams. $\frac{1}{13}^{th}$ of the students opted for Engineering, $\frac{1}{9}^{th}$ opted for Business Studies and $\frac{1}{5}^{th}$ of the remaining students opted for Humanities. If the number of students who opted for Humanities is 76, how many more students opted for Business Studies than Engineering?

(A) 14
(B) 16
(C) 18
(D) 20
(E) Question not attempted

84 A tank can be filled by Tap-A in 30 minutes and by Tap-B in 45 minutes. Both the taps are kept open for 6 minutes and then Tap-B is turned off. In how many minutes more does the tank get filled?

(A) 20 minutes
(B) 18 minutes
(C) 16 minutes
(D) 14 minutes
(E) Question not attempted

85 A solid cuboidal box has dimensions 20 cm × 16 cm × 6 cm. A cube of side 4 cm is removed from each corner of the solid. What percent of the volume of the original box is reduced?

(A) 25%
(B) 4%
(C) $26\frac{2}{3}\%$
(D) $16\frac{1}{3}\%$
(E) Question not attempted

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Qs. 86-87 : Each of these questions contains six statements followed by four sets of combinations of three. Choose the set in which the statements are logically related.

86 a. Laxman is a man.

b. Meera is Laxman's wife.

c. Some women are islands.

d. No man is an island.

e. Meera is not an island.

f. Laxman is not an island.

(A) ade (B) abe

(C) adf (D) cde

(E) Question not attempted

87 a. All snakes are reptiles.

b. All reptiles are not snakes.

c. All reptiles are cold blooded.

d. All snakes lay eggs.

e. All reptiles lay eggs.

f. Snakes are cold blooded.

(A) ade (B) bde

(C) abe (D) acf

(E) Question not attempted

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Qs. 88-90 : Each of these has a question followed by two statements I and II. Mark the answer as:

(A) if the question can be answered with the help of statement I alone,

(B) if the question can be answered with the help of statement II alone,

(C) if both the statements I and II are needed to answer the question, and

(D) if the question cannot be answered even with the help of both the statements.

(E) Question not attempted

88 Is it more profitable for a company to produce product Q?

I. Product R is sold at a price four times that of Q.

II. One unit of Q requires 2 units of labour, while one unit of R requires 5 units of labour. There is no other constraint on production.

89 What is the value of prime number 'x'?

I. $x^2 + x$ is a two-digit number greater than 50.

II. x^3 is a three-digit number.

90 The average of three unequal quotations for a particular share is ₹ 110. If all the quotations are in integral values of rupee, does the highest quotation exceed ₹ 129?

I. The lowest quotation is ₹ 100.

II. One of the quotations is ₹ 115.

91 Which of the following statements is / are correct about Nada?

1. It lies about 2 km southeast of Panchkula across Ghaggar.

2. There is a famous Gurudwara here, named after Nadu Shah.

3. Guru Gobind singh ji camped at this place with his army.

Now choose the correct option from the options given below:

(A) 1 and 2 Only

(B) 2 and 3 Only

(C) 1 and 3 Only

(D) 1, 2 and 3 All

(E) Question not attempted

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92 Match list I and List II :

	List I		**List II**
a.	Tomb of Raja Khetri	I.	Tosham
b.	Samadhi of Mungipa	II.	Charkhi Dadri
c.	Samadhi of Baba Shami Dayal	III.	Loharu
d.	Samadhi of Todar singh	IV.	Bhiwani

Now choose the correct answer from the following:

(A) a-III, b-II, c-I, d-IV
(B) a-II, b-I, c-IV, d-III
(C) a-III, b-I, c-II, d-IV
(D) a-I, b-II, c-III, d-IV
(E) Question not attempted

93 Which of the following towns is said to have been founded by the famous Mahabharata hero, Yudhisthira?

(A) Julana
(B) Uchana
(C) Pindara
(D) Kaithal
(E) Question not attempted

94 Read the following paragraph about revolt of 1857:

He was the only chief present with the British army at Delhi. After the fall of Delhi, he returned to his state, but not his troops. He left 25 men for service at Larsoli tahsil, and the same number at Delhi. He sent a detachment of 200 men with General van Courtland to Hansi and 100 men under their commander Khan Singh to Jhajjar with Col. Lawrence. Besides these 250 troops remained stationed at Rohtak, 50 at Gohana till the parganas were fairly settled for good. He was greatly rewarded after the expiry of the uprising of 1857.

The paragraph given above describes which prince/princely state?

(A) Hassan Ali khan of Dujana
(B) Akbar Ali of Pataudi
(C) Ahmad Ali of Farrukhnagar
(D) Raja Sarup Singh of Jind
(E) Question not attempted

95 On whose advice, Kosli town of Haryana was founded by Kosal Singh?

(A) On advice of his wife
(B) On advice of a sage
(C) On advice of the British
(D) On advice of his son
(E) Question not attempted

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Qs 96-100 : Answer the questions based on the contents of the respective passages:

Current positions over the prospects of the Indian economy seem to swing between alarmism and triumphalism. For example, you can juxtapose Morgan Stanley's exuberant recent report on India's impending economic boom, with analysis that comes out of Centre for Monitoring Indian Economy (CMIE) on India's dismal employment record and the enduring constraint it poses. A lot of economic debate is shaped by political mood affiliation. There are genuine difficulties figuring out what is going on. In some cases, there just is not enough data, a situation not helped by the government's diffidence to data. Different shocks have taught us how much of our knowledge of the economy is post-facto. Growth is also often a product of some conjunctures. What may seem like a structural impediment to growth at a particular time can be compensated for by changing circumstances. But it is worth taking the optimists' case seriously. Why might we think India is more competitive and attractive now? Will any of these conditions obtain? The central element in the optimist's story is India's vastly improved infrastructure. India's logistics, while not top class, are improving. Interestingly, Morgan Stanley argues that land is not a binding constraint (perhaps it never was). India's digital infrastructure is potentially outstanding. Optimism here seems well founded. But the Morgan Stanley report makes two further claims. The first, that the digital infrastructure will lead to off shoring of services to India, and second, it will lead to enhanced access to credit which will enable growth. Both are plausible claims, but by no means certain. The second pitch is India's energy transition. India's economic performance traditionally has been tied to the price of oil. The optimists are betting on a major green energy transition that will not just bring more investment but make India energy self-sufficient and competitive. This is in the plausible but not easy category. There is a big "if" in this story. The third element is a revival of manufacturing optimism. The production-linked incentive schemes can, at the margins, work. The baby steps in defence manufacturing could reach a critical mass where we begin to create an ecosystem with enormous spillover effects. The pessimists are too quick to dismiss this possibility. This is now a plausible story, but whether and when it will materialise is still an open question.

96 Which of the following statements could be considered as conclusions of the author of the passage as borne out by its contents?

i. Currently the Indian economy is seemingly swinging wildly between pessimism and optimism.

ii. The shape of the economy of a country is as much dependent on emotional factors as it is on economic factors.

iii. Morgan Stanley is reportedly optimistic about the prospects of India's economy while CMIE is reportedly pessimistic about the same.

iv. The Government of India had tasked both Morgan Stanley and CMIE with analysing the current prospects of India's economy and received divergent reports about the same from the two parties.

(A) iii and iv
(B) iii only
(C) i, ii, iii
(D) i, ii, iii and iv
(E) Question not attempted

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97 Which of the following statements regarding the state of the economy of a country could be inferred from the contents of the passage?

i. Relevant data could play an important role in helping analyse the ground realities about the same.

ii. The factors affecting it could vary over time and with circumstances.

iii. Political leanings too affect an individual's perception about the same.

iv. The government of the day decides how much data is gathered and analysed both qualitatively and quantitatively, to study the same.

v. Several times it happens that one learns the actual truth about it by hindsight.

vi. It is preferable to take the observations and opinions of the optimists on the same more seriously than those of the pessimists.

(A) i, ii, iii and vi
(B) ii, iv and v
(C) i, ii, iii, iv and v
(D) i, ii, iii, iv, v and vi
(E) Question not attempted

98 The factors on which Morgan Stanley is basing its optimism about the Indian economy are:

i. The reasonably robust infrastructure facilities in the country

ii. The abundant land resources of India

iii. Offshore digital infrastructure services available to us

iv. Enhanced access to credit facilities brought about by the availability of digital infrastructure in India

(A) i, ii and iv
(B) i and ii
(C) i, ii and iii
(D) i, ii, iii and iv
(E) Question not attempted

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99 Which of the following statements could be inferred with certainty from the passage?

i. India is in a transitional phase in terms of its energy consumption pattern.

ii. India is on the verge of becoming one of the top producers of green energy in the world.

iii. India has for long been a large-scale consumer of oil.

(A) i and ii
(B) ii and iii
(C) i and iii
(D) i, ii and iii
(E) Question not attempted

100 Which of the following statements about the manufacturing sector in India implied in the passage?

i. It has been on a downswing and needs to be revived on priority for the economy to flourish.

ii. It is the third most important factor in the economic development of the country.

iii. The government should offer production-linked incentives for the industry to grow further.

iv. The industries should offer productivity-linked incentives to their employees for increasing production.

v. Defence manufacturing is presently in its nascent stage in the country but could grow significantly and even influence growth in other industries.

(A) i, ii and iii
(B) i, ii, iii and iv
(C) i, ii, iii, iv and v
(D) i, iii and v
(E) Question not attempted

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