

U.G. 3rd Semester Examination-2024**MATHEMATICS****[Multidisciplinary Course (MDC)]****Course Code : MATH-MD-T-03****(Basic Mathematics)****[NEP-2020]****Full Marks : 35****Time : 90 Minutes****Instructions to the Candidates:**

- Candidates will be provided with a question cum answer booklet.
- The booklet contain 30 multiple choice questions in two parts:
 - Part-A: 18 questions (1 mark each)
 - Part-B: 12 questions (2 marks each)

The candidate must attempt 25 questions in total.

- Candidates must fill up his/her Registration Number, Year & Roll Number in the space provided.
- Do not make any rough work on the answer booklet.
- At the end of the examination please return the answer booklet to the invigilator.

Registration No.**Year****Roll Number****Signature of the Invigilator***[Turn Over]*

PART-A

Answer any fifteen questions from the following. [Choose the correct option and put tick ($\checkmark$) mark beside given box]:

1×15=15

1. If a set S has n elements, then the number of all subsets of S is
 - a) 2^n ☐
 - b) $n!$ ☐
 - c) n ☐
 - d) n^2 ☐
2. If $A \subseteq B$, then $A \cap B$ equals
 - a) $\emptyset$ ☐
 - b) A ☐
 - c) B ☐
 - d) None of these ☐
3. The identity $(A \cup B)' = A' \cap B'$ is an example of
 - a) De Morgan's Law ☐
 - b) Distributive Law ☐
 - c) Associative Law ☐
 - d) Commutative Law ☐
4. For a complex number $z = x + iy$, the modulus $|z|$ is
 - a) $x + y$ ☐
 - b) $\sqrt{x^2 + y^2}$ ☐
 - c) $x^2 + y^2$ ☐
 - d) None of these ☐
5. The complex conjugate of $z = 3 - 4i$ is
 - a) $3 + 4i$ ☐
 - b) $3 - 4i$ ☐
 - c) $-3 + 4i$ ☐
 - d) $4 - 3i$ ☐
6. For the quadratic equation $ax^2 + bx + c = 0$, the equation has two distinct real roots if
 - a) $b^2 - 4ac > 0$ ☐
 - b) $b^2 - 4ac < 0$ ☐
 - c) $b^2 - 4ac = 0$ ☐
 - d) None of these ☐

[Turn Over]

7. The sum of the roots of $ax^2 + bx + c = 0$ is
- $-\frac{b}{a}$ ☐
 - $\frac{c}{a}$ ☐
 - $-\frac{a}{b}$ ☐
 - $b^2 - 4ac$ ☐
8. The equation $x^2 + 1 = 0$ has
- 2 real roots ☐
 - 1 real root ☐
 - 0 real roots ☐
 - Infinitely many real roots ☐
9. A matrix that has the same number of rows and columns is called
- Rectangular matrix ☐
 - Square matrix ☐
 - Diagonal matrix ☐
 - Scalar matrix ☐
10. The determinant of the $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$ is
- $ad - bc$ ☐
 - $ad + bc$ ☐
 - $ab - cd$ ☐
 - $ab + cd$ ☐
11. If A is a square matrix, the matrix obtained by interchanging the rows and columns of A is called
- Cofactor of A ☐
 - Adjoint of A ☐
 - Transpose of A ☐
 - Inverse of A ☐
12. For a skew-symmetric matrix A of even order, which of the following is always true?
- $\det(A) = 0$ ☐
 - $\det(A) > 0$ ☐
 - $\det(A) < 0$ ☐
 - $\det(A) = 1$ ☐

13. Which one of the following is an example of *primary* data?
- Data from a published newspaper ☐
 - Data from a government census 10 years ago ☐
 - Data collected directly from respondents by a researcher ☐
 - Data from a historical textbook ☐
14. Continuous data are data that
- can only take integer values ☐
 - can take any value within an interval ☐
 - are based on categories ☐
 - are artificially constructed ☐
15. The difference between the maximum and minimum values in a dataset is called
- Variance ☐
 - Range ☐
 - Standard Deviation ☐
 - Mode ☐
16. The arithmetic mean of the numbers 4, 6, and 8 is
- 4 ☐
 - 6 ☐
 - 7 ☐
 - 8 ☐
17. Which of the following is *not* a measure of central tendency?
- Mean ☐
 - Median ☐
 - Mode ☐
 - Standard Deviation ☐
18. Which measure of dispersion is defined as the *positive square root* of the variance?
- Standard Deviation ☐
 - Mean Deviation ☐
 - Range ☐
 - Coefficient of Variation ☐

PART-B

Answer any ten questions from the following. [Choose the correct option and put tick (✓) mark beside given box]: $2 \times 10 = 20$

19. The power set of $\{\emptyset, 1\}$ is
- a) $\{\emptyset, 1\}$ ☐
- b) $\{\{\emptyset\}, \{1\}\}$ ☐
- c) $\{\emptyset, \{\emptyset\}, \{1\}, \{\emptyset, 1\}\}$ ☐
- d) $\{\emptyset, 1, \{\emptyset\}, \{1\}\}$ ☐
20. If $z_1 = r(\cos \theta + i \sin \theta)$ and $z_2 = s(\cos \phi + i \sin \phi)$, then $z_1 z_2 = \dots$
- a) $rs[\cos(\theta - \phi) + i \sin(\theta - \phi)]$ ☐
- b) $rs[\cos(\theta + \phi) + i \sin(\theta + \phi)]$ ☐
- c) $r + s[\cos(\theta + \phi) + i \sin(\theta + \phi)]$ ☐
- d) $r + s[\cos(\theta - \phi) + i \sin(\theta - \phi)]$ ☐
21. De Moivre's theorem states that $(\cos \theta + i \sin \theta)^n = \dots$
- a) $\cos(n\theta) + i \sin(n\theta)$ ☐
- b) $\cos(n\theta) - i \sin(n\theta)$ ☐
- c) $r^n[\cos(n\theta) + i \sin(n\theta)]$ ☐
- d) $\cos(\theta) + i \sin(\theta)$ ☐
22. Descartes' Rule of Signs is used to determine
- a) The sum of the roots ☐
- b) The possible number of positive and negative real roots ☐
- c) The product of the roots ☐
- d) All of the above ☐
23. If α and β are the roots of $x^2 - 5x + 6 = 0$, then $\alpha + \beta$ is
- a) 6 ☐
- b) 5 ☐
- c) 1 ☐
- d) -5 ☐

24. The inverse of $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$ (assuming $ad - bc \neq 0$) is
- a) $\begin{pmatrix} d & -b \\ -c & a \end{pmatrix}$ ☐
- b) $\frac{1}{ad - bc} \begin{pmatrix} d & -b \\ -c & a \end{pmatrix}$ ☐
- c) $\begin{pmatrix} -d & b \\ c & -a \end{pmatrix}$ ☐
- d) $\begin{pmatrix} a & c \\ b & d \end{pmatrix}$ ☐
25. A histogram is a graphical representation of
- a) Categorical data in discrete intervals ☐
- b) Frequencies of a continuous variable by class intervals ☐
- c) Relationships between two variables ☐
- d) None of the above ☐
26. The *cumulative frequency* of a class in a frequency distribution is obtained by
- a) Summing frequencies from highest to lowest class ☐
- b) Summing frequencies from lowest to highest class ☐
- c) Multiplying each frequency by the class midpoint ☐
- d) Summing the midpoints only ☐
27. An *ogive* is
- a) A bar chart ☐
- b) A line graph of cumulative frequencies ☐
- c) A pie chart ☐
- d) A measure of central tendency ☐

28. The median of the set {3,5,7,9,11} is

- a) 3
- b) 7
- c) 9
- d) 5

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29. If the standard deviation of a dataset is zero, it implies

- a) All observations are identical
- b) The mean is zero
- c) The dataset has no observations
- d) None of the above

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30. The coefficient of variation (CV) is defined as

- a) $\left(\frac{\text{Standard Deviation}}{\text{Mean}} \right) \times 100\%$
- b) $\left(\frac{\text{Mean}}{\text{Standard Deviation}} \right) \times 100\%$
- c) $\left(\frac{\text{Variance}}{\text{Mean}} \right) \times 100\%$
- d) $\left(\frac{\text{Range}}{\text{Mean}} \right) \times 100\%$

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