MAHATMA GANDHI UNIVERSITY, KOTTAYAM

SECOND SEMESTER EXAMINATION MGU-UGP (HONOURS) REGULAR EXAMINATION

(2024 ADMISION ONWARDS)

Multi-Disciplinary Course - MG2MDCMAT100- APPLICABLE MATHEMATICS

Duration: 1.25 hrs Maximum Marks: 50

Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Interest (I), Appreciation (Ap), and Skill (S)

Students should attempt atleast one question from each course outcome to enhance their overall outcome attainability.

Answer any 25 questions. Each question carries 2 marks

1. A matrix with only one row is called: [K][1]
   a) Column matrix b) Row matrix
   c) Identity matrix (d) Square matrix

2. The transpose of a matrix is obtained by: [K][1]
   a) Multiplying all elements by -1 b) Swapping rows and columns
   c) Adding all elements (d) Taking the inverse

3. A matrix in which all elements are zero is called: [K][1]
   a) Identity matrix b) Null matrix
   c) Diagonal matrix (d) Square matrix

4. Which of the following matrices is a *diagonal matrix*? [K][1]
   a) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 5 \end{bmatrix}$ b) $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$ c) $\begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix}$ d) $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$

5. A matrix B is called symmetric if: [K][1]

   a) $B = B^{-1}$ b) $B^T = B$ c) $B^T = -B$ d) $\det(B) = 0$

6. Given the matrices A and B:

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}, \quad B = \begin{bmatrix} 9 & 8 & 7 \\ 6 & 5 & 4 \\ 3 & 2 & 1 \end{bmatrix}$$

   What is the sum of matrices A and B? [A][1]

   a) $\begin{bmatrix} 10 & 10 & 10 \\ 10 & 10 & 10 \\ 10 & 10 & 10 \end{bmatrix}$ b) $\begin{bmatrix} 8 & 10 & 10 \\ 10 & 10 & 10 \\ 10 & 10 & 10 \end{bmatrix}$ c) $\begin{bmatrix} 10 & 10 & 10 \\ 10 & 10 & 10 \\ 10 & 10 & 10 \end{bmatrix}$

   d) $\begin{bmatrix} 10 & 10 & 10 \\ 10 & 10 & 10 \\ 10 & 10 & 10 \end{bmatrix}$

7. Let A and B be two matrices, where

$$A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}, \quad B = \begin{pmatrix} 5 & 6 \\ 7 & 8 \end{pmatrix}$$

   What is the product AB? [A][1]

   a) $\begin{pmatrix} 19 & 22 \\ 43 & 50 \end{pmatrix}$ b) $\begin{pmatrix} 23 & 26 \\ 31 & 38 \end{pmatrix}$ c) $\begin{pmatrix} 23 & 28 \\ 31 & 38 \end{pmatrix}$ d) $\begin{pmatrix} 17 & 20 \\ 39 & 46 \end{pmatrix}$

8. Given the matrices A and B:

$$A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}, \quad B = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$$

   Which of the following statements is correct regarding the multiplication of matrices A and B? [A][1]

   a) Matrix multiplication $A \times B$ is defined.
   b) Matrix multiplication $A \times B$ is not defined because the number of columns in A does not match the number of rows in B.
   c) Matrix multiplication $A \times B$ is defined and the resulting matrix will be 2×3.
   d) Matrix multiplication $A \times B$ is defined and the resulting matrix will be 2×2.

9. The roots of the quadratic equation $x^2 - 5x + 6 = 0$ are [U][2]
   a) $x = 2$ and $x = 3$ b) $x = -2$ and $x = 3$
   c) $x = 2$ and $x = -3$ (d) $x = -2$ and $x = -3$

10. The sum of the roots of the quadratic equation $x^2 - 4 = 0$ is [A][2]
    a) 0 b) 4 c) -4 (d) 1

11. The product of the roots of the quadratic equation
    $x^2 - x - 1 = 0$ is [A][2]
    a) 0 b) 1 c) -1 d) 2

12. Consider the quadratic equation:

$$2x^2 - 3x - 5 = 0$$

    What is the number of positive roots of this equation? [A][2]
    a) 2 b) 1 c) 0 d) 3

13. What are the roots of the cubic polynomial
    $x^3 - 6x^2 + 11x - 6 = 0$? [U][2]
    a) $x = 1, 2, 3$ b) $x = -1, 2, 3$ c) $x = 1, -2, 3$ d) $x = 1, 3, -6$

14. What are the factors of the quadratic equation
    $x^2 + 7x + 10 = 0$? [A][2]

    a) $(x + 5)(x + 2)$ b) $(x - 5)(x - 2)$
    c) $(x + 10)(x + 1)$ (d) $(x + 7)(x + 3)$

15. How many number plates of 3 digits can be formed with four digits 1, 2, 3 and 4? [U][3]
    a)24 b)36 c) 12 d)18

16. If $nP_3 = 210$, then n is. [A][3]
    a)12 b)8 c) 7 d)10

17. Evaluate $\frac{n!}{r!(n-r)!}$ when $n = 5, r = 2$. [U][3]
    a)18 b)10 c) 15 d)16

18. If $nC_2 = nC_5$, then n is. [A][3]
a)5 b)7 c) 9 d)10

19. How many quadilaterals can be formed by joining the vertices of an octagon? [U][3]
a)80 b)70 c) 12 d)8

20. Find the number of ways in which 4 identical balls can be distributed among 6 identical boxes, if not more than one ball goes into a box? [U][3]
a)4 b)6 c) 10 d)15

21. Find the number of triangles formed by joining the vertices of a polygon of 12 sides [U][3]
a)9! b)220 c) 9 d)120

22. In a party every person shakes hand with every other person. If there was a total of 210 handshakes in the party, find the number of person who present in the party. [A][3]
a)21 b)105 c) 10 d)70

23. Find the value of $\frac{d}{dx}(x^{13})$ [A][4]
a)$13x^{12}$ b)$13x^2$ c) $12x^{13}$ d)$13x$

24. The slope of the tangent line to the curve $y = x^2 + 4x + 7$ at $x = 1$ is [A][4]

a)7 b)6 c) 1 d)0

25. Find $f''(1)$, where $f(x) = 6x^5 - 4x^2$ [A][4]

a)120 b)112 c) 8 d)-128

26. Find y'' if $y = 7x^3 - 5x^2 + x$. [A][4]
a) $21x^2 - 10x + 1$ b) $7x^2 - 2x^5 + 1$ c) $42x - 10$ d) $21x - 10$

27. Find the derivative of the function $f(x)$, where
$f(x) = (x+1)(2x-1)$ [U][4]
a)$4x-1$ b)$4x+3$ c) $2x^2-1$ d)$4x+1$

28. Find the derivative of the function $f(x)$, where
$f(x) = \frac{x}{x^2+1}$ [U][4]
a)$x+1$ b)x^2+1 c) $\frac{x-1}{x^2+1}$ d)$\frac{(x-1)^2}{(x^2+1)^2}$

29. If $y(x) = \sin x + \cos x$, then $y'(x)$ is [U][4]

a)$\sin x + \cos x$ b)$\cos x - \sin x$ c) $-\sin x - \cos x$ d)$\sin x - \cos x$

30. If $y(x) = \cos x^3$, then $y'(x)$ is [U][4]
a)$\sin x^3$ b)$-\sin x^3$ c) $-3x^2 \sin x^3$ d)$3x^2 \sin x^3$