D1BMT2102 (S3) **Reg. No.............................**

Name: ....

FIRST SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2024

(Improvement/Supplementary)

MATHEMATICS: COMPLEMENTARY COURSE FOR PHYSICS, CHEMISTRY & CS

GMAT1C01T: MATHEMATICS -1

Time: 2 Hours **Maximum Marks: 60**

SECTION A: Answer the following questions. Each carries *two* marks.
(Ceiling 20 marks)

1. Find the volume of the solid generated by revolving the region between the y-axis and the curve $x = 2/y$, $1 \leq y \leq 4$, about the y-axis.
2. Find the point of inflection of $y = x^3$.
3. State any three properties of definite integrals.
4. Find the augmented matrix of the following system of equations.

$$x + 3y - 4z = 6$$
$$3x - y = 4$$
$$4x + 3y - 2z = -2$$

5. If A = $\begin{bmatrix} 0 & 1 \\ 2 & 1 \end{bmatrix}$ Find the rank of A^2
6. Find the critical points of the function $y = \frac{x+4}{x-2}$.
7. Give an example of a function which is increasing in $(-\infty,\infty)$
8. Find the rank of the matrix $\begin{bmatrix} 4 & 0 & 5 \\ 1 & 2 & 0 \\ 0 & 3 & 1 \end{bmatrix}$.
9. If f is continuous and $\int_0^2 f(x)dx = -4$, $\int_1^5 f(x)dx = 6$ then $\int_2^5 f(x)dx =$ ... ...
10. Find the area of the region enclosed by the curve $y = x^4$ and the line $y = 8x$ from 0 to 2.
11. Find the area between $y = 2sin\, x$ and $y = sin\, 2x$ from 0 to π.
12. Show that a matrix and its transpose have same characteristic roots.

(PTO)

SECTION B: Answer the following questions. Each carries *five* marks.
(Ceiling 30 marks)

13. Verify Roll's theorem for the function $f(x) = x^2 - 3x + 2$ on the interval [1 , 2].
14. Find the interval on which $g(x) = -x^3 + 12x \quad +5\ , -3 \leq x \leq 3$ is increasing and decreasing. Also find its inflection point.
15. Find A^2 using the Cayley Hamilton theorem and then find A^3 if A = $\begin{bmatrix} 1 & 2 \\ -1 & 3 \end{bmatrix}$.
16. Graph the function $y = (x-2)^3 + 1$.
17. For the matrix A obtain an equivalent matrix B and from it, determine the rank of A.

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 1 & 3 \\ 3 & 2 & 1 \end{bmatrix}$$

18. State mean value theorem for definite integrals and show that if f is continuous on $[a, b]$ and definite integral over $[a, b]$ is 0 , then f(x) = 0 for at least one x in $[a, b]$.
19. Find the eigenvalues of the matrix $\begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$.

SECTION C: Answer any *one* question. The question carries *ten* marks.

20. a. Find all asymptote of the function $f(x) = \frac{x^3+1}{x}$.

    b. Graph the function , $y = \frac{x^3+1}{x}$ include the graphs and equations of the asymptotes and dominant terms.

21. Answer the following:

    a. Find the length of the curve $y = \left(\frac{3}{4}\right) x^{\frac{4}{3}} - \left(\frac{3}{8}\right) x^{\frac{2}{3}} + 5.\ from\ x = 1\ to\ x = 8.$

    b. Find the area of the surface generated by revolving the curve $x = y^3/3\ , 0 \leq y \leq 1$ about the y axis.

(1 x 10 = 10 Marks)