D1BMT2302 (PAGES 2) **Reg.No.............................**

Name: ....

FIRST SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2023

(Regular/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. Define singular and non-singular matrix with examples.
2. Find the eigen values of the matrix A = $\begin{bmatrix} 8 & 1 \\ 6 & 7 \end{bmatrix}$
3. State Cayley Hamilton theorem.
4. Find the row reduced echelon form of the matrix A = $\begin{bmatrix} 2 & 4 & 6 \\ 4 & 8 & 10 \end{bmatrix}$
5. Explain Rolle's theorem using the function $g(x) = \frac{x^3}{3} - 3x\,, -3 \leq x \leq 3$.
6. Find the critical point of the function $y = x^{\frac{3}{4}}$.
7. State first derivative theorem for increasing and decreasing functions.
8. Find the horizontal asymptote of the curve $xy = 1$.
9. Evaluate $\lim_{x \to 0} \frac{x - \sin x}{x^3}$.
10. A pyramid 3m high has a square base that is 3m on a side. The cross-section of the pyramid perpendicular to the altitude x m down from the vertex is a square x m on a side. Find the volume of the Pyramid.
11. Find the area of the region between the curve $y = 3x^2$ and the x axis on the interval $[0, b]$.
12. Evaluate $\int_{-1}^{1} t^3(1 + t^4)^3 dt$.

(PTO)

SECTION B: Answer the following questions. Each carries *five* marks.

(Ceiling 30 Marks)

13. Obtain the row equivalent canonical matrix C to the matrix A = $\begin{bmatrix} 1 & 2 & -1 & 4 \\ 2 & 4 & 3 & 5 \\ -1 & -2 & 6 & -7 \end{bmatrix}$ and hence find its rank.
14. Prove that the equations.

$$3x + 4y + 5z = a$$

$$4x + 5y + 6z = b$$

$$5x + 6y + 7z = c$$ are consistent only when $a + c = 2b$.

15. Find A^3 using the Cayley Hamilton theorem , if A = $\begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$.
16. Find the interval on which $f(x) = x^4 - 8x^2 \ + 16$, $-3 \leq x \leq 3$ is increasing and decreasing. Also find what points if any, does f assume local maximum and minimum values?
17. State mean value theorem. Find the point c of Mean Value Theorem for the function $f(x) = 1 - x^2$ in $0 \leq x \leq 2$.
18. Find the volume of the solid generated by revolving the region between the parabola $x = y^2 + 1$ and the line x = 3 about the line x = 3.
19. Find the area of the region enclosed by the parabola $x = y^2$ and the line $x = y + 2$.

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

20. Graph the function, $y = \frac{x^2-1}{x}$ including the graphs and equations of the asymptotes and dominant terms.

21. Answer the following
    a. Find the length of the curve $x = (y^3/6) + 1/(2y)$ from y=2 to y=3
    b. Find the area of the surface generated by revolving the curve $y = x^3$, $0 \leq x \leq 1/2$ about the x axis.

(1 x 10 = 10 Marks)