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D1BMT2202 (PAGES 2) Reg.No................................

Name: ....

FIRST SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2022

(Regular/Improvement/Supplementary)

MATHEMATICS: COMPLEMENTARY COURSE FOR PHYSICS, CHEM1STRY & CS

GMAT1C01T: MATHEMATICS -1

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

SECTION A: Answer the following questions. Each carries 2 marks.
(Ceiling 20 Marks)

1. Define a singular matrix. Give one example of a 2x2 singular matrix.

2. Find the rank of **(a)** 3x3 identity matrix and **(b)** 4x2 zero matrix.

3. Define Characteristic root and Characteristic vector.

4. State Second Derivative Test of Concavity

5. Find the area of the region between the curve $y = \sqrt{x}, 0 \le x \le 4$ and the x- axis.

6. State **(a)** Rolle's Theorem and **(b)** Mean Value Theorem.

7. Find $\lim_{x \to 0} \frac{3x - \sin x}{x}$.

8. Evaluate $\int_0^2 \left(\frac{t^2}{4} - 7t + 5 \right) dt$.

9. Define **(a)** Absolute maximum and **(b)** Local maximum.

10. State Cavalieri's statement.

11. Define **(a)** Critical point and **(b)** Point of inflection.

12. Write the parametric representation of a circle with radius r and centre at origin.

SECTION B: Answer the following questions. Each carries 5 marks
(Ceiling 30 Marks)

13. Reduce $\begin{bmatrix} 2 & 0 & 4 & 6 \\ 2 & 1 & 0 & 1 \\ 8 & 2 & 8 & 14 \end{bmatrix}$ to Normal form and find its rank.

14. Solve $3x - 2y + 3z = 8, \ 2x + y - z - 1 = 0, \ 4x - 3y + 2z = 4$

15. Find the absolute extrema values of $g(t) = 8t - t^4$ on $[-2,1]$.

16. Find $\lim_{x \to 0} x^{\frac{1}{x}}$.

17. Find the length of the graph $f(x) = \frac{x^3}{12} + \frac{1}{x}, 1 \le x \le 4$.

(PTO)

18. The line segment $x = 1 - y, 0 \le y \le 1$, is revolved about the y- axis to generate the cone. Find its Lateral Surface Area.

19. A curved wedge is cut from a cylinder of radius 3 by two planes. One plane is perpendicular to the axis of the cylinder. The second plane crosses the first plane at a 45° angle at the centre of the cylinder. Find the volume of the wedge.

SECTION C: Answer any 1 question. Each carries 10 marks.

20. (a) Verify Cayley Hamilton theorem for $A = \begin{bmatrix} 1 & 1 & 2 \\ 3 & 1 & 1 \\ 2 & 3 & 1 \end{bmatrix}$

(b) Find $\frac{dy}{dx}$, if $y = \int_1^{x^2} \cos t \ dt$

21. (a) Find the critical points of $f(x) = x^{\frac{4}{3}} - 4x^{\frac{1}{3}}$. Identify the intervals on which f is increasing and decreasing. Find the functions local and absolute extreme values.

(b) Find the asymptote of the curve $y = \frac{x+3}{x+2}$

(1 × 10 = 10 Marks)