25U202 (Pages: 2) Name : .....

Reg. No : .....

SECOND SEMESTER UG DEGREE EXAMINATION, APRIL 2026

(FYUGP)

(Regular/Supplementary/Improvement)

CC24UMAT2MN102 - CALCULUS AND MATRIX ALGEBRA

(Mathematics - Minor Course)

(2024 Admission onwards)

Time: 2.0 Hours Maximum: 70 Marks

Credit: 4

Part A (Short answer questions)

Answer ***all*** questions. Each question carries 3 marks.

1. Evaluate $\int \sin(2x+4)dx$ using appropriate substitution. [Level:3] [CO1]
2. Evaluate $\int \frac{t^2-2t^4}{t^4}\,dt$ [Level:3] [CO1]
3. Express the integral $\int_1^2 \sqrt{x}\,dx$ as limit of Riemann sums [Level:2] [CO1]
4. Find the average value of the function $f(x)=e^x$ over the interval $[-1,\ln 5]$. [Level:3] [CO2]
5. Using substitution, evaluate $\int_0^2 (4x-2)^3\,dx$ [Level:3] [CO2]
6. Evaluate $\lim\limits_{(x,y)\to(3,2)} x\cos\pi y$. [Level:2] [CO3]
7. Find $f_x(1,3)$ and $f_y(1,3)$ for the function $f(x,y)=2x^3y^2+2y+4x$. [Level:3] [CO4]
8. If $f(x,y)=\frac{y}{x}$, then find its contour map. [Level:2] [CO3]
9. Let $A=\begin{pmatrix}5 & 0\\ 0 & 3\end{pmatrix}$. Find the eigenvalues of A^{-1}. [Level:2] [CO5]
10. Find the matrix $C=2A-3B$ where $A=\begin{pmatrix}4 & 5\\ -6 & 9\end{pmatrix}$ and $B=\begin{pmatrix}-2 & 4\\ 8 & -10\end{pmatrix}$ [Level:2] [CO5]

(Ceiling: 24 Marks)

Part B (Paragraph questions/Problem)

Answer ***all*** questions. Each question carries 6 marks.

11. Find the total area between the curve $y=x^2-x$ and the x-axis over the interval $[0,2]$. [Level:3] [CO1]
12. Calculate $\int x\sin 3x\,dx$ [Level:3] [CO2]
13. Using the method of partial fractions, calculate $\int \frac{dx}{x^2-6x-7}$ [Level:3] [CO2]

14. Find the arc length of the curve $x = \frac{1}{3}\left(y^2+2\right)^{3/2} \quad \text{from} \quad y=0 \quad \text{to} \quad y=1$ [Level:3] [CO2]

15. Find the second-order partial derivatives of $f(x,y) = y^3 e^{-5x}$. [Level:3] [CO4]

16. Let $f(x,y) = xy^2z^3 + 3$. Find [Level:2] [CO3]

    a) $f(2,1,2)$

    b) $f(-3,2,1)$

    c) $f(a,a,a)$

    d) $f(a+b, a-b, b)$

17. Construct an orthogonal matrix from the eigenvectors of the given symmetric matrix $\begin{pmatrix} 1 & 3 \\ 3 & 1 \end{pmatrix}$ [Level:3] [CO5]

18. Find the eigenvalues of $A = \begin{pmatrix} 1 & 2 & 1 \\ 6 & -1 & 0 \\ -1 & -2 & -1 \end{pmatrix}$. [Level:2] [CO5]

(Ceiling: 36 Marks)

Part C (Essay questions)

Answer any ***one*** question. The question carries 10 marks.

19. Find the area of the region enclosed by $y = \sqrt{x}$ and $y = x - 2$.. [Level:3] [CO2]

20. Solve the linear system using Gauss-Jordan elimination. [Level:3] [CO5]

$$\begin{aligned} 2x_1 + 6x_2 + x_3 &= 7 \\ x_1 + 2x_2 - x_3 &= -1 \\ 5x_1 + 7x_2 - 4x_3 &= 9 \end{aligned}$$

(1 × 10 = 10 Marks)

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