

Reg No:.....
Name :.....

K25FY2466 B

Second Semester FYUGP Mathematics Examination
APRIL 2025 (2024 Admission onwards)
KU2DSCMAT117 (CALCULUS AND MATRIX ALGEBRA
II)
(DATE OF EXAM: 30-4-2025)

Time : 120 min

Maximum Marks : 70

Part A (Answer any 6 questions. Each carries 3 marks)

1. Write the n^{th} derivative of e^{mx} . 3
2. Write the n^{th} derivative of x^n . 3
3. Write the expansion of $\log(1+x)$ in powers of x . 3
4. Evaluate $\int_0^{\frac{\pi}{2}} \sin^5 x \, dx$. 3
5. Evaluate $\int_0^{\frac{\pi}{2}} \sin^7 x \, dx$. 3
6. Evaluate $\int_0^{\frac{\pi}{2}} \cos^4 x \sin^3 x \, dx$. 3
7. Determine whether $G = \begin{bmatrix} 0 & 0.5 \\ -0.25 & 0.25 \end{bmatrix}$ is the inverse of $C = \begin{bmatrix} 2 & -4 \\ 2 & 0 \end{bmatrix}$. 3
8. Determine whether $G = \begin{bmatrix} 0 & 0.5 \\ -0.25 & 0.25 \end{bmatrix}$ is the inverse of $A = \begin{bmatrix} 4 & -8 \\ 4 & 0 \end{bmatrix}$. 3

Part B (Answer any 4 questions. Each carries 6 marks)

9. Determine the n^{th} derivative of $\cos(ax+b)$. 6
10. Expand $\log(1+x)$ using Maclaurin's series. 6
11. Expand $\log_e x$ in powers of $(x-1)$ and hence evaluate $\log_e 1.1$ correct to 4 decimal places. 6
12. Evaluate $\int_0^{\pi} \sin^5 \frac{1}{2} x \, dx$. 6
13. Evaluate $\int \sin^4 x \cos^4 x \, dx$. 6
14. Evaluate $\int \tan^4 x \, dx$. 6

Part C (Answer any 2 question(s). Each carries 14 marks)

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15. Express $\frac{\partial w}{\partial r}$ and $\frac{\partial w}{\partial s}$ in terms of r and s if $w = x+2y+z^2$, $x = \frac{r}{s}$, $y = r^2 + \ln s$, $z = 2r$. 14
16. Find all the second order partial derivatives of the function
(a) $h(x,y) = xe^y + y + 1$
(b) $w = ye^{x^2-y}$. 14
17. Verify Cayley-Hamilton theorem for the matrix $A = \begin{bmatrix} 5 & 2 & 2 \\ 3 & 6 & 3 \\ 6 & 6 & 9 \end{bmatrix}$. 14