

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

First Semester FYUGP Mathematics Examination
November 2024 (2024 Admission onwards)
KU1DSCMAT112 (CALCULUS AND MATRIX ALGEBRA)
(EXAM DATE : 06-12-2024)

Time : 120 min

Maximum Marks : 70

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

- 1. Simplify the expression: $\ln(e^{2\ln x})$. 3
- 2. Find $\lim_{y \rightarrow 0} \frac{y^2}{y^3 + 6}$. 3
- 3. Does the limit $\lim_{x \rightarrow 1} \frac{1}{x-1}$ exist? Justify. 3
- 4. If $h(t) = t - \frac{1}{t}$, find the value of $h'(t)$ at $t = -1$. 3
- 5. If $y = \sin u, u = 3x + 1$, find $\frac{dy}{dx}$. 3
- 6. Determine the integral $\int x\sqrt{2x+1} dx$. 3
- 7. Compute $\int_0^{1/2} \frac{1}{\sqrt{1-x^2}} dx$. 3
- 8. Compute $\int_0^{\pi/2} \sin x dx$. 3

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

- 9. Simplify using the rules for exponents (a) $7^\pi \cdot 8^\pi$ (b) $(\frac{4}{9})^{\frac{1}{2}}$ (c) $(5^2)^{\frac{3}{2}}$. 6
- 10. Solve for y in terms of $x : \ln(y^2 - 1) - \ln(y + 1) = \ln(\sin x)$. 6
- 11. Compute the value of the limit $\lim_{x \rightarrow 1} \frac{x^4 - 1}{x^3 - 1}$. 6
- 12. Evaluate $\int e^x \cos x dx$ 6
- 13. Evaluate $\int x \cos x dx$. 6
- 14. Evaluate $\int_0^1 \frac{3x^2}{1+x^3} dx$. 6

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

- 15. Find the eigen values and the corresponding eigen vectors of the matrix $\begin{bmatrix} 3 & 0 & 12 \\ -6 & 3 & 0 \\ 9 & 6 & 3 \end{bmatrix}$. 14
- 16. Find the eigen values and the corresponding eigen vectors of the matrix $\begin{bmatrix} 4 & -2 & 3 \\ -2 & 1 & 6 \\ 1 & 2 & 2 \end{bmatrix}$. 14
- 17. Find $\frac{dy}{dx}$ using the method of logarithmic differentiation, if
 - (a) $y = \frac{(x^2 - 8)^{1/3} \sqrt{x^3 + 1}}{x^6 - 7x + 5}$
 - (b) $y = (\ln x)^{\tan x}$.14