Reg No:..... K24FY1473(C)
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 $\lim_{y\to 0} \dfrac{y^2}{y^3+6}$. 3

3. Does the limit $\lim_{x\to 1} \dfrac{1}{x-1}$ exist ? Justify. 3

4. If $h(t) = t - \dfrac{1}{t}$, find the value of $h'(t)$ at $t = -1$. 3

5. If $y = \sin u, u = 3x + 1$, find $\dfrac{dy}{dx}$. 3

6. Determine the integral $\int x\sqrt{2x+1}\, dx$. 3

7. Compute $\int_0^{1/2} \dfrac{1}{\sqrt{1-x^2}}\, dx$. 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) $\left(\frac{4}{9}\right)^{\frac{1}{2}}$ (c) $(5^2)^{\frac{5}{2}}$. 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 $\lim_{u\to 1} \dfrac{u^4-1}{u^3-1}$. 6

12. Evaluate $\int e^x \cos x\, dx$ 6

13. Evaluate $\int x \cos x\ dx$. 6

14. Evaluate $\int_0^1 \dfrac{3x^2}{1+x^3}\, dx$. 6

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

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15. Find the eigen values and the corresponding eigen vectors of the matrix $\begin{bmatrix} 3 & 0 & 12 \\ -6 & 3 & 0 \\ 9 & 6 & 3 \end{bmatrix}$.

16. Find the eigen values and the corresponding eigen vectors of the matrix $\begin{bmatrix} 4 & -2 & 3 \\ -2 & 1 & 6 \\ 1 & 2 & 2 \end{bmatrix}$.

17. Find $\dfrac{dy}{dx}$ using the method of logarithmic differentiation, if

    (a) $y = \dfrac{(x^2-8)^{1/3}\sqrt{x^3+1}}{x^6-7x+5}$

    (b) $y = (\ln x)^{\tan x}$.

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