

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

K24FY1477(C)

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First Semester FYUGP Mathematics Examination
November 2024 (2024 Admission onwards)
KU1DSCMAT117 (CALCULUS AND MATRIX ALGEBRA -
I)
(EXAM DATE : 06-12-2024)

Time : 120 min

Maximum Marks : 70

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

1. Simplify $2^{\log_4(x)}$. 3
2. Use the laws of exponents to simplify the following expressions:
(a) $4^{\frac{1}{3}} \cdot 4^{\frac{1}{5}}$
(b) $(8^{\frac{1}{2}})^3$. 3
3. Determine $\lim_{h \rightarrow 0} \frac{\sqrt{9+h} - 3}{h}$. 3
4. Find $\frac{d}{dx} (x^{\frac{2}{3}})$. 3
5. Find $\frac{d}{dx} (\cot x)$. 3
6. Determine $\int (1 - \cos 2x) dx$. 3
7. Compute $\int_0^1 \frac{1}{x^2+1} dx$. 3
8. Evaluate $\int_0^{\pi/4} \sec^2 x dx$. 3

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

9. Albert invests an amount of Rs.100 in the year 2000 at an annual interest rate of 5.5%. Predict the amount in 2004. 6
10. (a) $\lim_{x \rightarrow 1} \frac{x^2 + x - 2}{x^2 - x}$
(b) $\lim_{x \rightarrow 5} \frac{x - 5}{x^2 - 25}$ 6
11. If $2 - x^2 \leq g(x) \leq 2 \cos x$ for all x , find $\lim_{x \rightarrow 0} g(x)$, using the Sandwich Theorem. 6
12. Evaluate $\int x \cos x dx$. 6

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13. Evaluate $\int \frac{\sin^2 x + \cos^3 x}{\sin^2 x \cos^2 x} dx$. 6
14. Compute $\int_0^{\pi/3} \frac{2 + 3 \sin x}{\cos^2 x} dx$. 6

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

15. Solve the system of equations associated with the following augmented matrix:

$$\left[\begin{array}{ccc|c} 1 & 1 & 0 & 3 \\ 2 & 0 & -1 & 4 \\ 0 & 3 & 1 & 5 \end{array} \right]$$

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16. Solve the system of equations:

$$\begin{aligned} 7x_2 + 9x_3 &= 0 \\ 2x_1 + x_2 - x_3 &= 0 \\ 5x_1 + 6x_2 + 2x_3 &= 0. \end{aligned}$$

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17. Suppose u and v are functions of x that are differentiable at $x = 1$ and that $u(1) = 3, u'(1) = 1, v(1) = -2, v'(1) = 2$. Evaluate the following derivatives at $x = 1$.
(i) $\frac{d}{dx} \left(\frac{u}{v} \right)$
(ii) $\frac{d}{dx} (8u + 7v)$.
(iii) Evaluate $\frac{d}{dx} [\ln \cosh x]$. 14

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