Reg No:..... K24FY1477(C)
Name :.....

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) $4^{\frac{1}{3}}.4^{\frac{1}{6}}$
   (b) $(8^{\frac{1}{9}})^3$. 3

3. Determine $\lim_{h\to 0} \dfrac{\sqrt{9+h}-3}{h}$. 3

4. Find $\dfrac{d}{dx}\left(x^{\frac{2}{3}}\right)$. 3

5. Find $\dfrac{d}{dx}(\cot x)$. 3

6. Determine $\int (1-\cos 2x)dx$. 3

7. Compute $\int_0^1 \dfrac{1}{x^2+1}\,dx$. 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) $\lim_{x\to 1} \dfrac{x^2+x-2}{x^2-x}$
    (b) $\lim_{x\to 5} \dfrac{x-5}{x^2-25}$ 6

11. If $2-x^2 \le g(x) \le 2\cos x$ for all x, find $\lim_{x\to 0} g(x)$, 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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