



Reg No:.....

Name :.....

K24FY1341(C)

First Semester FYUGP Mathematics Examination
November 2024 (2024 Admission onwards)
KU1DSCMAT111 (BASIC MATHEMATICS I)
(EXAM DATE : 06-12-2024)

Time : 120 min

Maximum Marks : 70

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

1. If $g(t) = \frac{1}{t^2}$, find $g'(t)$ at $t = -1$. 3

2. Find the derivative of $y = \frac{\cos x}{1 - \sin x}$ w.r.t. x . 3

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

4. Using integration, calculate the area enclosed between the x -axis, the curve $y = e^x$ and the two ordinates $x = -1$, $x = 1$ 3

5. Compute $\int_0^1 \frac{1}{x^2 + 1} dx$. 3

6. Compute the inverse of the matrix

$$A = \begin{bmatrix} 4 & 3 \\ 1 & 0 \end{bmatrix}$$

3

7. Determine the rank of the matrix

$$A = \begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix}$$

3

8. Determine the rank of the matrix

$$A = \begin{bmatrix} 4 & 6 \\ 8 & 12 \end{bmatrix}$$

3

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

9. Determine the integral $\int \frac{1}{e^x + e^{-x}} dx$. 6

10. Evaluate $\int \frac{x^4}{x^2 + 1} dx$. 6

11. Compute $\int_0^{3/2} \frac{1}{\sqrt{9-x^2}} dx$.

6

12. Express the matrix A as the sum of a symmetric and a skew-symmetric matrix where

$$A = \begin{bmatrix} a & a & b \\ c & b & b \\ c & a & c \end{bmatrix}.$$

6

13. Express the matrix A as the sum of a symmetric and a skew-symmetric matrix where

$$A = \begin{bmatrix} 3 & -2 & 6 \\ 2 & 7 & -1 \\ 5 & 4 & 0 \end{bmatrix}.$$

6

14. Determine the rank of the matrix

$$\begin{bmatrix} 3 & -1 & 2 \\ -6 & 2 & 4 \\ -3 & 1 & 2 \end{bmatrix}.$$

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

15. (a) Find the domain and range for the function $g(t) = \cos(e^{-t})$.
 (b) Prove that $\cosh^2 x - \sinh^2 x = 1$.
 (c) Compute $\lim_{x \rightarrow 1} \frac{x^2 + x - 2}{x^2 - x}$.

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16. (a) Find the inverse of $y = \frac{x+1}{2}$, expressed as a function of x .
 (b) Show that $2 \sinh x \cosh x = \sinh 2x$.
 (c) Compute $\lim_{x \rightarrow 1} \frac{x^2 + x - 2}{x^2 - x}$.

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

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