PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

MAKE UP EXAMINATION-JAN 2023

Course Code: MAT105

Course Name: CALCULUS AND LINEAR ALGEBRA

Program   : B.Tech

Date: 20-JAN-2023

Time: 9:30AM to 12:30PM

Max Marks: 100

Weightage: 50 %

Instructions:
(i) Read the all questions carefully and answer accordingly.
(ii) Question paper consists of 3 parts
(iii) Scientific and Non-programmable calculators are permitted.

Part A [Memory Recall Questions]

Answer all the Questions. Each Question carries TWO marks.   (10Qx 2M=20M)

1. State Lagrange's mean value theorem   (CO1) [Knowledge]

2. $\lim\limits_{x\to 0} \dfrac{\tan x}{x}$ = _____   (CO1) [Knowledge]

3. If $u = x^2 y$ then $\dfrac{\partial u}{\partial x}$ = _____ and $\dfrac{\partial^2 u}{\partial x^2}$ = _____   (CO2) [Knowledge]

4. If $u = \dfrac{x^4 + y^4}{x + y}$ then by Euler's theorem $x\dfrac{\partial u}{\partial x} + y\dfrac{\partial u}{\partial y} =$ _____   (CO2) [Knowledge]

5. The value of $\int\limits_{0}^{\infty} e^{-x} \, x^{3/2} \, dx$ is _____   (CO3) [Knowledge]

6. $\beta\left(\dfrac{1}{2}, \dfrac{1}{2}\right) =$ _____   (CO3) [Knowledge]

7. The half range sine series of f(x) in $(0, \pi)$ is _____ where $b_n =$ _____
                                                                                     (CO4) [Knowledge]

8. If $\sum u_n$ is a series of positive terms and if $\lim\limits_{n\to\infty} \dfrac{u_n}{u_{n+1}} < 1$ then $\sum u_n$ is _____
                                                                                     (CO1) [Knowledge]

9. In Gauss elimination method the coefficient matrix is reduced to _____ matrix
   and in Gauss Jordan method the coefficient matrix is reduced to _____ matrix.
                                                                                     (CO5) [Knowledge]

10. Rank of the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 0 & 2 & -1 \\ 0 & 2 & -1 \end{bmatrix}$ is _____ (CO5) [Knowledge]

Part B [Thought Provoking Questions]

Answer all the Questions. Each Question carries TEN marks.   **(5Qx10M=50M)**

11. Using Maclaurin's series expand $\sin x + \cos x$ up to the term containing x^3

(CO1) [Comprehension]

12. Find the maximum and minimum value of the function

$f(x, y) = x^3 + 3xy^2 - 15x^2 - 15y^2 + 72x$ (CO 2) [Comprehension]

13. Test the convergence of the series $\dfrac{1}{4.7.10} + \dfrac{1}{7.10.13} + \dfrac{1}{10.13.16} + ...$

(CO 4) [Comprehension]

14. Obtain the half range cosine series of the function $f(x) = x$ in $(0, 2)$

(CO4) [Comprehension]

15. Solve the following system of equations using Gauss Jordan method

$10x + y + z = 12, \quad 2x + 10y + z = 13, \quad x + y + 5z = 7$

(CO5) [Comprehension]

Part C [Problem Solving Questions]

Answer both the Questions. Each Question carries FIFTEEN marks.   **(2Qx15M=30M)**

16. Obtain the reduction formula for $\int \cos^n x \ dx$ and $\int_0^{\pi/2} \cos^n x \ dx$

(CO3) [Comprehension]

17. Find all the eigenvalue and the corresponding eigenvector of the matrix $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$

(CO5) [Comprehension]