CLASS: B.ARCH.   SEMESTER : I
BRANCH: B.ARCH.   SESSION : MO/2023

SUBJECT: MA104 MATHEMATICS FOR ARCHITECTS

TIME: 3 Hours   FULL MARKS: 50

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL

Q.1(a)   Using the rank method, find whether the following equations are consistent or not, $x +$ [5] 1 3
         $y + 2z = 4$, $2x - y + 3z = 9$, $3x - y - z = 2$. If consistent, solve them.

Q.1(b)   Find the eigenvalues and eigenvectors of the matrix $A = \begin{pmatrix} 2 & 1 & 0 \\ 0 & 1 & 1 \\ 0 & 0 & 3 \end{pmatrix}$.   [5] 1 4

Q.2(a)   Find the critical points of the function $f(x) = -2x^3 + 6x^2 - 3$. Determine the local [5] 2 3
         maximum and local minimum values of $f(x)$.

Q.2(b)   Find the area of the region enclosed by the parabola $y = x^2 - 2x$ and the line [5] 2 3
         $y = x$.

Q.3(a)   Examine whether the limit exists or not? $\lim_{(x,y)\to(0,0)} \frac{xy}{x^2-y^2}$.   [5] 3 3

Q.3(b)   Evaluate $\frac{\partial w}{\partial u}$ and $\frac{\partial w}{\partial v}$ where $w = xy + yz + xz$, $x = u + v$, $y = u - v$, $z = uv$ at $(u,v) =$ [5] 3 4
         $\left(\frac{1}{2}, 1\right)$.

Q.4(a)   If $x = rcos\theta, y = rsin\theta, z = z$; then find the Jacobian $\frac{\partial(x,y,z)}{\partial(r,\theta,z)}$.   [5] 4 3

Q.4(b)   Find the local maximum/minimum values of the function [5] 4 3
         $f(x,y) = xy - x^2 - y^2 - 2x - 2y + 1$.

Q.5(a)   The following table shows the marks obtained by 100 candidates in an examination: [5] 5 3

Marks obtained:	1-10	11-20	21-30	31-40	41-50	51-60
No. of candidates	3	16	26	31	16	8

Q.5(b)   Marks obtained by 10 students in Mathematics and Physics are given below. Find the [5] 5 4
         coefficient of correlation between two subjects.

Math (x)	75	30	60	80	53	35	15	40	38	48
Physics (y)	85	45	54	91	85	63	35	43	45	44