

Subject : MATHEMATICS I (01MA0109)**Date : 30-Jun-2022****Time : 3 Hours****Total Marks : 100****Instructions :**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

Que.1 Answer the following objectives**[10]****(A)**

(1)
$$\int_1^2 \int_0^\pi \sin x \, dx dy$$

(a) 1 (b) 2
(c) 0 (d) 3

(2)In finding maximum and minimum values of function of u , what is t ?

(a) $\frac{\partial^2 u}{\partial x^2}$ (b) $\frac{\partial^2 u}{\partial y^2}$
 (c) $\frac{\partial^2 u}{\partial x \partial y}$ (d) NOT

(3)The series $2 - 2 + 2 - 2 + 2 - 2 + \dots$ is

- (A) Convergent (C) Oscillating
 (B) Divergent (D) None of these

(4)The series $\sum_{n=1}^{\infty} \frac{1}{n(\log n)^2}$ is

- (A) Oscillating (C) Convergent
 (B) Divergent (D) None of these

(5)

Which one of the following is false?

- (A) If the Eigen values of a square matrix are all distinct, then it is diagonalizable matrix.
 (B) An $n \times n$ matrix is diagonalizable iff it possesses n linearly dependent Eigen vectors.
 (C) The necessary and sufficient condition for a square matrix to be diagonalizable is that the geometric multiplicity of each of its Eigenvalues is equal to the algebraic multiplicity.
 (D) None of these

(6)

If the eigen value are negative with atleast one zero then the value class of quadratic form is

- (A) negative definite (C) indefinite
(B) negative semidefinite (D) none of these

(7) In finding maximum and minimum values of function of u, what is r?

- (a) $\frac{\partial^2 u}{\partial x^2}$ (b) $\frac{\partial^2 u}{\partial y^2}$
(c) $\frac{\partial^2 u}{\partial x \partial y}$ (d) NOT

(8) In finding maximum and minimum values of function of u, what is s?

- (a) $\frac{\partial^2 u}{\partial x^2}$ (b) $\frac{\partial^2 u}{\partial y^2}$
(c) $\frac{\partial^2 u}{\partial x \partial y}$ (d) NOT

(9) $\lim_{x \rightarrow 0} \frac{\sin(4x)}{\sin(3x)} = \underline{\hspace{2cm}}$

- A) 1 B) 4/3
C) 3/4 D) 0

(10) $\lim_{x \rightarrow 0} \frac{\sin(3x)}{x} = \underline{\hspace{2cm}}$

- A) 1 B) 3
C) 1/3 D) ∞

Que.1 Answer the following questions.

[10]

(B)

(1) If $f(x) = x \cos x$ in $(-\pi, \pi)$ then what is the value of a_n ?

(2) Evaluate $\int_0^1 \int_0^1 y^2 dy dx$

(3) Evaluate $\int_0^1 \int_0^1 x dy dx$

(4) Evaluate $\int_0^1 \int_{-1}^1 x^2 dx dy$

(5) Evaluate $\int_0^1 \int_{-1}^1 y dx dy$

(6) Evaluate $\int_0^1 \int_0^1 x^2 dy dx$

(7) Find $\frac{dy}{dx}$, if $x^2 - y^2 + \sin(xy) = 0$

(8) What happens when $l < 1$ in Cauchy's root test?

(9) What is the condition function to be even?

(10) Find $\frac{dy}{dx}$, if $x^3 + y^3 = 7xy$

Que.2

(A) Find extreme values of $xy + 27\left(\frac{1}{x} + \frac{1}{y}\right)$ [8]

(B) Find the half-range sine series of $f(x) = x$; $0 < x < 1$
 $= 2 - x$; $0 < x < 2$ [8]

Hence, deduce that $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots$

OR

(B) Obtain the Fourier series of $f(x) = \left(\frac{\pi-x}{2}\right)^2$ in the interval $0 \leq x \leq 2\pi$. [8]

Que.3

(A) Determine the diagonal matrix from $A = \begin{bmatrix} 1 & 0 \\ -1 & 2 \end{bmatrix}$. Hence find A^{10} and A^{13} . [8]

(B) $u = e^{xyz}$ P.T. $\frac{\partial^3 u}{\partial x \partial y \partial z} = (1 + 3xyz + x^2 y^2 z^2) e^{xyz}$ [4]

(C) Test the convergence of the series $\frac{1}{1 \cdot 2 \cdot 3} + \frac{3}{2 \cdot 3 \cdot 4} + \frac{5}{3 \cdot 4 \cdot 5} + \frac{7}{4 \cdot 5 \cdot 6} + \dots$ [4]

OR

(A) - - [8]
 Using Cayley-Hamilton theorem find A^2 , A^{-1} and A^{-2} from $A = \begin{bmatrix} -2 & 1 \\ 2 & 4 \end{bmatrix}$

(B) Test the convergence of the series $\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \dots$ [4]

(C) [4]

$u = x^3y + e^{xy^2}$ then prove that $\frac{\partial^2 u}{\partial x \partial y} = \frac{\partial^2 u}{\partial y \partial x}$

Que.4

(A) Obtain the range of convergence of $\sum_{n=1}^{\infty} \frac{x^n}{n + \sqrt{1+n^2}}$ [8]

(B) If $\lim_{x \rightarrow 0} \frac{\sin 2x + k \sin x}{2x^3}$ be finite, find the value of k and hence the limit. [8]

OR

(A)
$$\int_{x=0}^1 \int_{y=0}^{\sqrt{1-x^2}} \int_{z=0}^{\sqrt{1-x^2-y^2}} \frac{dz dy dx}{\sqrt{(1-x^2-y^2-z^2)}}$$
 [8]

(B) Evaluate $\int_{-c}^c \int_{-b-a}^b \int_a^c (x^2 + y^2 + z^2) dz dy dx$ [8]

Que.5

(A) Test the convergence of the series $\sum_{n=1}^{\infty} \frac{(2n^2-1)^{1/3}}{(3n^3+2n+5)^{1/4}}$ [6]

(B) Find the Fourier series of $f(x) = \begin{cases} -1; & 0 < x < \pi \\ 2; & \pi < x < 2\pi \end{cases}$ [6]

(C) Evaluate
$$\int_{-2}^2 \int_0^3 x^2 y dx dy$$
 [4]

OR

(A) Solve the following by Gauss-Elimination Method: [6]

$$x + y + 2z = 9$$

$$2x + 4y - 3z = 1$$

$$3x + 6y - 5z = 0$$

(B) Find the Reduced Row-echelon form of the matrix [6]

$$A = \begin{bmatrix} 1 & -1 & 1 & 0 & 2 \\ 2 & -2 & 0 & 2 & 2 \\ -1 & 1 & 2 & -3 & 1 \\ -2 & 2 & 1 & -3 & -1 \end{bmatrix}$$

(C) [4]

Find the values of $\frac{\partial^2 f}{\partial x^2}$ and $\frac{\partial^2 f}{\partial x \partial y}$ at the point (1, 2) from $f(x, y) = x^2 + 3xy + y - 1$.

Que.6

(A) Evaluate $\int_{-c}^c \int_{-b}^b \int_{-a}^a (x^2 + y^2 + z^2) dz dy dx$ [8]

(B) Change the order of integration and evaluate $\int_0^2 \int_{\frac{y}{2}}^1 e^{x^2} dx dy$ [4]

(C) Evaluate $\int_{-2}^2 \int_0^3 x^2 y dx dy$ [4]

OR

(A) Find the extreme values of $x^3 + 3xy^2 - 15x^2 - 15y^2 + 72x$ [8]

(B) Find the total derivative $\frac{du}{dt}$ for $u = \sin\left(\frac{x}{y}\right)$ [4]

(C) Evaluate over R bounded by X axis , y=x line and x=1. $\iint_R \frac{\sin x}{x} dA,$ [4]

---Best of Luck---

MARWADI UNIVERSITY
MU-FOT
ELE-FOT1 (MU)
Semester 1 - Summer

Subject : MATHEMATICS I (01MA0109)

Date : 30-Jun-2022

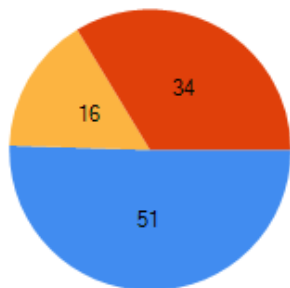
Time : 3 Hours

Total Marks : 100

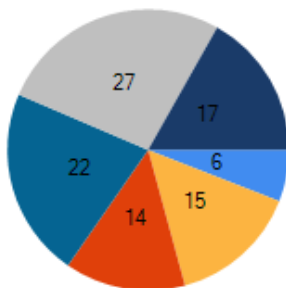
Difficulty Level	Weightage		No of Question	Total Marks	Question List
	Recommended	Actual			
High	20	50.58	12	87	1(A), 2(A), 2(B), 3(A), 4(A), 4(B), 5(A), 6(A)
Low	20	15.70	15	27	1(A), 1(B), 3(B), 3(C), 5(C), 6(B)
Medium	60	33.72	18	58	1(A), 1(B), 2(B), 3(B), 3(C), 5(A), 5(B), 5(C), 6(B), 6(C)

Module Name	Weightage		No of Question	Total Marks	Question List
	Recommended	Actual			
Module 1 :	15	5.81	3	10	1(A), 4(B)
Module 2 :	20	14.53	7	25	1(A), 1(B), 3(B), 3(C), 4(A), 5(A)
Module 3 :	10	13.95	5	24	1(B), 2(B), 5(B)
Module 4 :	20	21.51	11	37	1(A), 1(B), 2(A), 3(B), 3(C), 5(C), 6(A), 6(B)
Module 5 :	20	26.74	13	46	1(A), 1(B), 4(A), 4(B), 5(C), 6(A), 6(B), 6(C)
Module 6 :	15	17.44	6	30	1(A), 3(A), 5(A), 5(B)

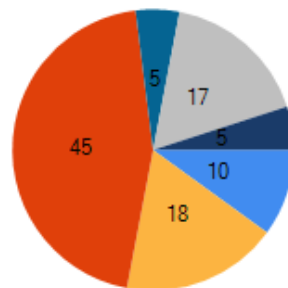
Blooms Taxonomy	Weightage		No of Question	Total Marks	Question List
	Recommended	Actual			
Remember / Knowledge	20	9.88	14	17	1(A), 1(B), 3(C)
Understand	30	18.02	12	31	1(A), 1(B), 3(B), 3(C), 4(B), 5(C), 6(B)
Apply	25	45.35	11	78	2(A), 2(B), 3(B), 4(A), 4(B), 5(A), 5(B), 6(A)
Analyze	15	4.65	1	8	2(B)
Evaluate	10	17.44	6	30	3(A), 5(A), 5(C), 6(B), 6(C)
Higher order Thinking	0	4.65	1	8	3(A)



High Low Medium



Module 1 : Module 2 :



Remember / Knowledge Unde...

