Total number of printed pages: **02** **Dip/2nd/DMA204**

2023

MATHEMATICS-II

Full Marks: 100

Time: Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. a) Find the median and mode from the following: (5+5=10)

Class Interval :	0-10	10-20	20-30	30-40	40-5
Frequency:	4	10	6	20	10

b) Calculate covariance and correlation co-efficient for the data which consists of the pairs: (3, 6), (0, 7), (4, 6) and (5, 1). (5+5=10)

2. a) The mean marks required by 25 students of section A of a class is 47, that of 35 students of section B is 51 and that of 30 students of section C is 53. Find the mean marks of the students of these three sections. (4)

b) Find the standard deviation from the following: (6)

X:	1	2	3	4	5
F:	2	1	8	2	4

c) Find the equation of the straight line passing through the point (2, -3) and is perpendicular to the line $4x - 5y + 9 = 0$. (5)

d) Find the acute angle between the lines $x - \sqrt{3}y = 1$ and $\sqrt{3}x - y = 4$. (5)

3 a) Find the equation of the circle passing through the points (1, 0), (0, 1) and (2, 1). (7)

b) Show that the triangle having vertices A(a, 0), B(-a, 0) and C(0, $a\sqrt{3}$) is equilateral. (5)

c) If the points (1, 0), (0, 1) and (a, b) are collinear, then prove that a+b=1. (4)

d) Find the gradient and inclination of the line joining the points (3, 4) and (-2, -1). (4)

(2+2 = 4)

4. **a)** If $f(x) = x + 5$ and $g(x) = x^3 - 3$, then find

(i) $f(g(x))$ (ii) $g(f(x))$

b) Evaluate the limit(any two) **(4× 2 = 8)**

(i) $\lim_{x\to 1}\frac{x^2-1}{x-1}$

(ii) $\lim_{x\to 1}\{2x + 5(\frac{x^2}{x^2+1})\}$

(iii) If $f(x) = \begin{cases} x^2 - 1, when\ 0 < x < 1 \\ 2x - 1, when\ 1 \le x \le 2 \end{cases}$

Find $\lim_{x\to 1} f(x)$

c) If $f: R \to R$ defined by $f(x) = \begin{cases} 1, if\ x\ belongs\ to\ Z \\ -1, if\ x\ does\ not\ belongs\ to\ Z \end{cases}$. (4)

Test the continuity of the above function at x = 1.

d) Examine whether the following function is bijective or not (4)

$f: R \to R$

Defined by $f(x) = \frac{1}{1-x}$

5. **a)** Using definition, find the derivatives of the following functions (4+4=8)

(i) $f(x) = e^{2x}$ (ii) $f(x) = x$

b) Evaluate (any three) **(3× 2 = 9)**

$\frac{dy}{dx}$ if

(i) $y = x^2 logx$ (ii) $y = \frac{d\sqrt{2x+3}}{dx}$

(iii) $x = y^x$ (iv) $x^2 + y^2 = 1$

c) Evaluate $\frac{d^2y}{dx^2}$ if $y^2 = 4ax$ (3)

6. **a)** Evaluate (any 2) **(2× 5 = 10)**

(i) $\int 4(7x - 2)^5\, dx$ (ii) $\int \frac{sinx+2cosx}{2sinx+cosx} dx$

(iii) $\int cos^3 x\, dx$ (iv) $\int \frac{1}{x^2+4x-1} dx$

b) Evaluate (any two) (5+5=10)

(i) $\int_2^4 2\sqrt{x}\, dx$ (ii) $\int_1^2 xlogx\, dx$ (iii) $\int_0^{\pi/2} \frac{1}{1+sinx} dx$

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