Total number of printed pages = 5

19/2nd Sem/DMA 204

2022

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 Mean, Median and Mode from the following : 2+4+4=10

Class Interval :	0-10	10-20	20-30	30-40	40-50
Frequency :	5	6	8	30	10

(b) 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. 5

(c) Find the Standard deviation from the following : 5

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

[Turn over

2. (a) Find the Quartile Deviation from the following : 10

Class Interval :	0-10	10-20	20-30	30-40	40-50
Frequency :	10	5	15	6	4

(b) Calculate Covariance and Correlation co-efficient for the data which consists of the pairs: (3, 6), (0, 7), (4, 6) and (5, 1).

5×2=10

3. (a) Evaluate : 4×2=8

(i) $\lim_{x\to\infty} \frac{x}{\sqrt{4x^2+1}-1}$

(ii) If $f(x)=\begin{cases} x^2+1, & \text{when } 0<x<1 \\ 2x+1, & \text{when } 1\le x\le 2 \end{cases}$,

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

(b) Test the continuity of the following function at the point $x=1$ 4

$$f(x)=\begin{cases} 1, & \text{if } x\in Z \\ -1, & \text{if } x\notin Z \end{cases},$$

(c) Examine whether the following function is bijective or not. 5

$f: R \to R$ defined by $f(x)=\frac{1}{1+x}$.

(d) Find the equation of the circle whose radius is 4 and which is concentric with the circle $x^2 + y^2 + 2x - 6y = 0$. 3

4. (a) Evaluate any *five* : $4 \times 5 = 20$

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

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

(v) $\int x^m \log x \, dx$ (vi) $\int x^2 \sin 2x \, dx$

(vii) $\int e^x \cos 3x \, dx$.

5. (a) Consider the function

$$f(x) = \begin{cases} x^2, \text{ when } 0 < x < 1 \\ x, \text{ when } 1 \leq x \leq 2 \end{cases}$$

Examine the differentiability of the function f at $x = 1$. 4

(b) Find $\frac{dy}{dx}$ (any *two*), if :

(i) $y = xe^{2x}$

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

(iii) $x^y = y^x$. 4×2=8

(c) Evaluate (any *two*) : 4×2=8

(i) $\int_1^2 \frac{\sqrt{3-x}}{\sqrt{x}+\sqrt{3-x}}\,dx$

(ii) $\int_1^2 x\log x\,dx$.

6. (a) In what ratio does the origin divide the line segment joining the points (–2, 0) and (4, 0) ? 5

(b) Find the Cartesian coordinates of the point whose polar coordinates are 5

(i) $\left(2\sqrt{2}, \frac{\pi}{4}\right)$ (ii) $\left(1, \frac{2\pi}{3}\right)$.

(c) If the distance between the points (r, 0) and (0, 4) be 5 units, find the value of r. 5

(d) If the points (1, 0), (0, 1) and (x, y) be collinear, prove that $x + y = 1$. 5

7. (a) Find the equation of the straight line which cuts the Y-axis at the point (0, –2) making an angle of 30° with $\overline{OX}$. 5

(b) Reduce the equation $2x + 3y - 5 = 0$ to

(i) Gradient form (ii) Intercept form. 5

(c) Find the equation of the straight line passing through the point (1, 2) and parallel to the straight line joining the points (3, – 4) and (–5, 6). 5

(d) The equations of two diameters of a circle are $x + y - 6 = 0$ and $x + 2y - 4 = 0$. If its radius be 10 units, find the equation of the circle. 5