

Dumkal College
U.G. 3rd Semester 1st Internal Examination-2024
MATHEMATICS
[MAJOR]
Course Code: MATH-M-T-03 & MATH-SEC-T-03

Full Marks: 10+10

Time: 1 Hour

*The figures in the right- hand margin indicate marks.
Symbols have their usual meaning.*

MATH-M-T-03

1. Answer any **three** questions: 3 × 2 = 6

- (a) Verify Rolles' theorem of the function $f(x) = x\sqrt{a^2 - x^2}$ in $[0, a]$.
- (b) Find limit superior and limit inferior of the sequence whose n-th term x_n is given by $x_n = \{1 + (-1)^n\}$.
- (c) In the mean value theorem $f(x + h) = f(x) + hf'(x + \theta h)$ where $0 < \theta < 1$ Show that the limiting value of θ as $h \rightarrow 0^+$ is $\frac{1}{2}$.
- (d) Give an example of a set $S \subseteq \mathbb{R}$ such that S is neither open nor closed set.
- (e) Show that the set Q of rational numbers is not the neighbourhood of any of its points.

2. Answer any **one** question: 1 × 4 = 4

- (a) If $f(x)$ is continuous in $[a, b]$ and $f'(x)$ exist in (a, b) . Then prove that there exists at least one value of x (say ϵ) between a and b (i.e. $a < \epsilon < b$) such that $f(b) - f(a) = (b - a)f'(\epsilon)$
- (b) (i) Construct two sequences whose limit points are 1 and -1.
(ii) Show that the series $\sum_{n=1}^{\infty} \frac{(n+1)^2}{n^3}$ is not convergent.

MATH-SEC-T-03

1. Answer any **three** questions:

$3 \times 2 = 6$

- (a) Constant in C
- (b) Key words
- (c) Escape Sequence
- (d) Arrays in C
- (e) Expressions in C.

2. Answer any one question:

$1 \times 4 = 4$

- (a) Write a C program to find the sum of first n natural numbers.
- (b) Write a C program to find the area of a triangle.
