National University of Computer & Emerging Sciences, Karachi
Fast school of computing
Fall -2022
Sessional-II Exam, 02nd November 2022, 10:00 AM – 11:00 AM

Course Code: MT-1003	**Course Name: Calculus and Analytical Geometry**
Instructors Name: Mr. Nadeem Khan, Miss Fareeha, Miss Asma Masood, Miss Urooj and Mr Usama Antuley	
Student Roll No:	**Section No:**

Instructions:

- Read each question completely before answering it. There are **5 questions and 2 pages**.
- Do not write anything on question paper. Return the question paper after exam.
- Attempt the question in sequence.
- Graphical calculator is not allowed.

Time: 01 Hour **Max. Marks**: 30 Points

Question 01: [CLO-4] [3+3=6]

Evaluate the limit of the following by using L'Hôpital's rule.

I. $\lim_{x\to+\infty}[\cos(\frac{2}{x})]^{x^2}$

II. $\lim_{t\to\frac{\pi}{2}^-}(sect - tant)$

Question 02: [CLO-4] [2+4=6]

(a): Define the following

I. Critical points
II. Stationary points
III. Inflection points
IV. Saddle points

(b): A stone dropped into a still pond sends out a circular ripple whose radius increases at a constant rate of 3 *ft/s*. How rapidly is the area enclosed by the ripple increasing at the end of 10 *s*?

Question 03: [CLO-4] [2+2+2=6]

If $f(x) = \frac{9}{14}x^{\frac{1}{3}}(x^2 - 7)$, Find

I. The intervals on which f is increasing and decreasing
II. The open intervals on which f is concave up and concave down
III. Relative maxima and minima.

Question 04: **[CLO-3]** **[3+3=6]**

Integrate the following by technique of integrating by parts.

I. $\int (4x^3 - 9x^2 + 7x + 3)e^{-x}dx$

II. $\int 6tan^{-1}(\frac{8}{w})dw$

Question 05: **[CLO-3]** **[3+3=6]**

Compute the Integral of the following.

I. $\int_0^{\frac{\pi}{2}} cos^6 x dx$

II. $\int \frac{x^2}{\sqrt{5+x^2}} dx$