University of Chittagong

Department of Mathematics

First year B.Sc. (Honours) Examination - 2022

Course Title: Calculus-1

Course Code: Math-102

Time: 4 Hours **Full Marks: 75**

[**Instruction:** Answer any **05 (Five)** questions. The questions are of equal marks and figures in the margin indicate full marks. **Answer the several parts of a question sequentially.**]

Q1. a) Discuss the relationship between relation and function. Define One to One function, Identity function and Even function with examples.

b) If $f : R-\left\{\frac{5}{4}\right\} \to R-\left\{\frac{1}{2}\right\}$ is defined by the formula $f(x) = \frac{2x+3}{4x-5}$ then find $y = f^{-1}(x)$.

c) A function is given-

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

i) Draw the graph of the given function $f(x)$.

ii) FInd the Domain and range of $f(x)$.

iii) Describe the properties of the graph of $f(x)$.

Q2. a) Define limit of function using $(\epsilon-\delta)$. Write the difference between $\lim_{x\to a} f(x)$ and $f(a)$.

b) Show that the function $f(x) = \begin{cases} x + \frac{1}{3} & \text{when } x \neq 0 \\ 0 & \text{when } x = 1 \end{cases}$ continuous but $f'(x)$ does not exist at $x = 0$.

c) Using the fundamental theorem of differentiability find differential coefficient of $\tan ax$.

Q3. a)

b)

c)

d)

Q4. a)

b)

c)

d)

Q5. a)

b)

c)

d)

Q6. a)

b)

c)

d)

Q7. a)

b)

c)

d)

Q8. a)

b)

c)

d)