Institute of Information Technology, University of Dhaka
Bachelor of Science in Software Engineering
First Year First Semester Final Examination, 2020
MATH 104: Calculus and Analytical Geometry
Marks: 30 Total Time: 1.30 Hours(Exam: 1.15Hr; Uploading: 15 minutes)

Professionalism **Excellence** **Respect**

Answer ALL of the following questions.

1 (a) Find the domain, range and then sketch: (i) $y = e^{-x+1} + 2$, (ii) $y = \sqrt{|x-1|}$. [**3**]

(b) Define limit at infinity, infinite limit and infinite limit at infinity. [**3**]

2.
Given $f(x) = \frac{2x^2-8}{x^2-16}$ and its $f'(x) = \frac{-48x}{(x^2-16)^2}$, $f''(x) = \frac{48(3x^2+16)}{(x^2-16)^3}$. Find the following information and sketch $f(x)$: Domain; Even/Odd/Neither; x and y intercepts (if any); Horizontal/Vertical asymptotes (if any); Critical numbers; Intervals where Increasing/Decreasing; Relative Extrema; Infection points (if any) and Concavity. [**6**]

3. (a) Suppose that a uniform metal rod 50 cm long is insulated laterally, and the temperatures at the exposed ends are maintained at 25^o c and 85^o c, respectively. Assume that the temperature $T(x)$ at each point x satisfies $\frac{d^2T}{dx^2} = 0$. Find $T(x)$ for $0 \leq x \leq 50$. [**3**]

(b) Evaluate using graphical point of view: [**3**]

$$\int_{-2}^{2} |x-1| \ dx$$

4. (a) Find the area of the region bounded by the curves $r = 6\cos\theta$ and $r = 2 + 2\cos\theta$. [**3**]

(b) Find the area of the surface generated by revolving the curve $x = \sqrt{9-y^2}$, $-2 \leq y \leq 2$ about the $y-$ axis. [**3**]

5. Find the solution of the following system with the help of the adjoint matrix: [**6**]

$$\begin{aligned} 5x + 3y - 3z &= -1, \\ 3x + 2y - 2z &= -1, \\ 2x - y + 2z &= 8. \end{aligned}$$