Name of student: .... Enrollment No. ....

BENNETT UNIVERSITY, GREATER NOIDA
B.TECH. 1st YEAR
Major Exam
FALL SEMESTER 2017-18

COURSE CODE : EMAT101L   MAX. TIME: 2 Hours
COURSE NAME: ENGINEERING CALCULUS
COURSE CREDIT: 3-1-0   MAX. MARKS: 45

Instructions:

- This paper contains 7 questions.

- All questions are mandatory.

1. True/False. Justify your answer. $[2 \times 5 = 10]$

   (a) $|\sin x| - |\sin y| > |x - y|$ for every value $x, y \in \mathbb{R}$.

   (b) Let $f : \mathbb{R}^2 \to \mathbb{R}$ be a function and $\vec{p} \in \mathbb{R}^2$ be any unit vector. Then $D_{\vec{p}} f(a, b) = \nabla f(a, b).\vec{p}$ is always true.

   (c) $\displaystyle\int_1^\infty \frac{dx}{x^4 + x}$ converges.

   (d) $f(x) = \begin{cases} 0 & x \in Q \\ 1 & x \notin Q, \end{cases}$ is Riemann integrable.

   (e) The following function $f : \mathbb{R}^2 \to \mathbb{R}$ is continuous at $(1, 1)$.

   $$f(x, y) = \begin{cases} x^2 + y^2 & (x, y) \neq (1, 1) \\ 3 & x = y = 1 \end{cases}$$

2. Let $f(x, y) = 4x^2 - 2xy + y^2 + 2$. Then

   (a) Find the linear approximation of f about the point $(1, 2)$.   [3]

   (b) Estimate the error, while approximating $f(x, y)$ with linear approximation in the rectangle $|x - 1| < 0.1$, $|y - 2| < 0.2$.   [2]

3. Evaluate the following integrals: $[3+4=7]$

   (a) $\displaystyle\int_{x=0}^\pi \int_{y=x}^\pi \frac{\sin y}{y} dy dx$, by changing the order of integration.