POSSESSION OF MOBILES IN EXAM IS UFM PRACTICE

Name of Student: .... **Enrollment No.** ....

Department: ....

BENNETT UNIVERSITY, GREATER NOIDA

End Term Examination, FALL SEMESTER 2018-19

COURSE CODE : EMAT101L

COURSE NAME: Engineering Calculus

COURSE CREDIT: 3-1-0

MAX. DURATION: 2 Hours

MAX. MARKS: 40

Instructions:

- All questions are mandatory.

1. For the function $f : \mathbb{R}^2 \to \mathbb{R}$, given below, show that exactly two of the following limits exist and are equal: [3]

$$\lim_{(x,y)\to(0,0)} f(x,y), \quad \lim_{x\to 0}\lim_{y\to 0} f(x,y), \quad \lim_{y\to 0}\lim_{x\to 0} f(x,y).$$

$$f(x,y) = \begin{cases} \frac{x^2y^2}{x^2y^2+(x^2-y^2)^2} & \text{when } x^2y^2+(x^2-y^2)^2 \neq 0 \\ 0 & \text{otherwise.} \end{cases}$$

2. Let $f : \mathbb{R}^2 \to \mathbb{R}$ be given by

$$f(x,y) = \begin{cases} \frac{y}{|y|}\sqrt{x^2+y^2} & if \quad y \neq 0, \\ 0 & if \quad y = 0. \end{cases}$$

Examine

(a) Continuity of f at $(0,0)$ [2]

(b) Existence of partial derivatives f_x and f_y at $(0,0)$ [2]

(c) Existence of the directional derivatives $D_u f$ at $(0,0)$ along each unit vector u. [2]

(d) Differentiability of f at $(0,0)$ [2]

3. Check whether $\lim_{(x,y)\to(0,0)} f(x,y)$ exists or not where [3]

$$f(x,y) = \left(1+\sqrt{x^2+y^2},\, y\sin\frac{1}{x},\, \frac{e^y \sin x}{x}\right).$$

4. Find all the local maxima, local minima and saddle points of the function $f(x,y) = 6x^2 - 2x^3 + 3y^2 + 6xy$. [4]

5. Evaluate the following double integrals: [3+4]

(a) $\int_0^{3/2} \int_0^{9-4x^2} 16x\,dydx$,

(b) $\int_0^{\pi} \int_x^{\pi} \frac{\sin y}{y} dydx$.

6. Use the transformation $x+y=u$ and $x-y=v$ to evaluate the integral [5]

$$\int_0^1 \int_0^{1-x} e^{\frac{x-y}{x+y}}\,dydx.$$

7. Find the volume of the solid formed under the paraboloid $z = x^2 + y^2$ and above the triangle enclosed by the lines $y = x$, $x = 0$, and $x + y = 2$ in the xy- plane. [5]

8. Evaluate the following integral: [5]

$$I = \iiint_D xyz\,dV \quad \text{where } D = \{(x,y,z) \in \mathbb{R}^3 : x^2 + y^2 \leq 1,\ 0 \leq z \leq x^2 + y^2\}.$$