The LNM Institute of Information Technology
Jaipur, Rajasthan
MATHEMATICS-I

End Term Exam (Part-1)

Series: A

November 18, 2015
Time: 50 minutes, Maximum Marks: 30

Name:______________________________ Roll No.:______________________________

Note: Each question carry 3 marks for correct answer and carry a **negative marking of 1 mark for wrong answer**. Some of the questions have four alternative answers (A, B, C, D) out of which one or more options may be correct. Encircle/Tick the **correct** answer(s). Any **Overwriting** will be treated as a wrong answer and **negative marks** will be awarded accordingly. Do not write anything here except the answer.

1. **Consider the sequence $a_n = \dfrac{n}{n+2}$. The minimum n_0 such that $|a_n - 1| < \frac{1}{100}$ for $n \geq n_0$, is**
   (A) 198, **(B)** 199, **(C)** 200, **(D)** 201.

2. **Given $\epsilon > 0$, the largest δ which fits the definition of continuity of the function**
   $$f(x) = \begin{cases} \frac{x+3}{2} & \textbf{if } x \leq 1 \\ \frac{7-x}{3} & \textbf{if } 1 \leq x \end{cases} \qquad \textbf{at } x = 1 \textbf{ is}$$
   (A) $\epsilon/2$, **(B)** $\epsilon/3$, **(C)** 2ϵ, **(D)** 3ϵ.

3. **The function $f(x) = e^{-\frac{1}{|x|}}$ for $x \neq 0$ and $f(0) = 0$ is concave up in m open intervals and concave down in n open intervals. Then (m, n) equals.**
   (A) $(0,1)$, **(B)** $(1,0)$, **(C)** $(1,2)$, **(D)** $(2,1)$.

4. **The sequence $a_n = \displaystyle\sum_{k=1}^{n} (-1)^k$ is**
   (A) bounded but not convergent, **(B)** both bounded and convergent,
   (C) convergent but not bounded, **(D)** neither bounded nor convergent.

5. **Let $f : [0,1] \to \mathbb{R}$ be a continuous function. Let $P = \left\{0, \dfrac{1}{10}, \dfrac{2}{10}, \cdots, 1\right\}$ and $Q = \left\{0, \dfrac{1}{100}, \dfrac{2}{100}, \cdots, 1\right\}$ be the partitions of $[0,1]$. Then**
   (**A** $L(P,f) \leq L(Q,f) \leq U(Q,f) \leq U(P,f)$, (**B**) $L(Q,f) \leq L(P,f) \leq U(P,f) \leq U(Q,f)$,
   (**C**) $L(Q,f) \leq L(P,f)$ and $U(Q,f) \leq U(P,f)$, (**D**) None of above.

6. **The curve $r = 2\cos\theta, 0 \leq \theta \leq \pi$ represents a**
   (A) circle, (B) cardioid, (C) lemniscate, (D) ray.

7. **Parametric equations of the line through $P(-1,4,2)$ and in the direction of $\overrightarrow{v} = (1,2,3)$ is: __________.**

8. **Let f be a scalar field defined on $\mathbb{R}^2$ and suppose directional derivatives of f exist for all directions. Then f is continuous. TRUE or FALSE ____________________.**

9. **The double integral $\displaystyle\int\int_D e^{-(x^2+y^2)} dA$, where D is the region between the two circles $x^2 + y^2 = 1$ and $x^2 + y^2 = 4$ equals:**
   (A) $\pi(e^{-1} - e^{-3})$, **(B)** $\pi(e^{-1} - e^{-4})$, **(C)** $\pi(e^{-2} - e^{-3})$, **(D)** $\pi(e^{-2} - e^{-4})$.

10. **The value of the line integral $\int_C x - y \, ds$, where C is the line segment from $(1,3)$ to $(5,-2)$ is: ____________________.**