LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc.DEGREE EXAMINATION – **STATISTICS**

SECONDSEMESTER – APRIL 2017

S 215 – ANALYSIS - I

Date: 29-04-2017 Dept. No. Max. : 100 Marks
09:00-12:00

PART – A

Answer all the questions **10 x 2=20**

1. Define a rational number.
2. Define Absolute value or Modulus of x of a real number.
3. Find the Supremum and Infimumof $f(x) = x^2, -1 < x < 2$.
4. Find $\lim_{x \to \infty} \frac{3x^2+1}{x^2-3}$
5. When do you say $f(x)$ is continuous at $x = a$?
6. What is the limit of the sequence $1+\left(\frac{1}{2}\right)^n$?
7. Find the sum $1+\frac{1}{2}+\left(\frac{1}{2}\right)^2+\left(\frac{1}{2}\right)^3+.....$
8. Give an example of an increasing sequence?
9. State Mean value theorem.
10. Define the derivative of a function at a point.

PART - B

Answer any 5 questions **5 x 8=40**

11. Show that if $f(x) \to \alpha, g(x) \to \beta \ as \ x \to a$ then $f(x)+g(x) \to \alpha+\beta \ as \ x \to a$.
12. Show that $\lim_{x \to 1} \frac{x^2-3x+1}{x^3-3x^2+2} = \frac{1}{3}$.
13. Explain the different types of discontinuity.
14. State and prove Rolles theorem.
15. Show that $\sqrt{2}$ is irrational.
16. If $f'(a) > 0$ then show that f is strictly increasing in a neighborhood of $x = a$.
17. Find $\lim_{n \to \infty} \frac{n+3}{n^2-1}$.
18. Discuss the convergence of $\sum_{n=1}^{\infty} \frac{1}{n}$.

PART- C

Answer any 2 questions **2 x 20=40**

19. a) State and prove Cauchys inequality **(10 marks)**

    b) Prove that $(1+p)^n > 1+np, n = 2,3,4,\ldots, p > 0$ **(10 marks)**

20. a) If $\{x_n\}$ is increasing, then show that either Sup $x_n = M$ and $x_n \to M \ as \ n \to \infty$

or $x_n \to \infty \ as \ n \to \infty$. **(10 marks)**

    b) State and prove Cauchys general principle of Convergence of a sequence.(10 marks)

21. Discuss the convergence of

    a) $\sum_{n=1}^{\infty} \frac{n}{n^4 - 3}$ **(10 marks)**

    b) $\sum_{n=1}^{\infty} \frac{x^n}{n!}$ **(10 marks)**

22. a) Find the extreme values of the function $f(x) = x^4 - 8x^3 + 18x^2 - 14$. **(10 marks)**

    b) Verify Rolles theorem for $f(x) = (x-1)(x+1), -1 \le x \le 1$. **(10 marks)**

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