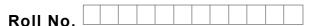
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Total No. of Pages : 02

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(Sem.-3)

B.Sc. (Computer Science) (2013 & Onwards) SEQUENCE SERIES AND CALCULUS Subject Code : BCS-302 Paper ID : [A3136]

Time: 3 Hrs.

Max. Marks: 60

INSTRUCTIONS TO CANDIDATES :

- SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks 1. each.
- SECTION-B contains SIX questions carrying TEN marks each and students have 2. to attempt ANY FOUR questions.

SECTION-A

- 1. Write briefly :
 - a) Test whether the sequence $\{a_n\}$ where $a_n = ln\left(1 + \frac{1}{n}\right)^n$ is convergent or divergent?
 - b) Using non-decreasing sequence theorem test the convergence of sequence $\{a_n\}$

where $a_n = \frac{3n+1}{n+1}$

 $\sum_{n=1}^{\infty} \frac{(-1)^n n}{n^2 + 1}$ c) Discuss the convergence of the series

- d) State Cauchy's condensation test.
- e) Differentiate between conditional and absolute convergence of an alternating series.
- f) Define upper integral of a bounded functions on [a, b].

g) Determine whether
$$\int_{1}^{\infty} \frac{dx}{x^2}$$
 converges or not ?

h) Define absolute convergence of an improper integral.

i) Evaluate the integral
$$\int_{1}^{\infty} x^3 e^{-x} dx$$
 by expressing it in terms of gamma function

j) Prove that beta function is symmetric.

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SECTION-B

- 2. State and explain the Cauchy's convergence criterion. (10)
- 3. a) State and prove integral test for testing the convergence/ divergence of a positive term infinite series. (5)
 - b) Examine for convergence and absolute convergence of the series $\sum_{n=0}^{\infty} \frac{(-1)^n n}{n^2 + 1}.$ (5)
- 4. Discuss the convergence /divergence of the following infinite series :

$$\left(\frac{1}{3}\right)^2 + \left(\frac{1.4}{3.6}\right)^2 + \left(\frac{1.4.7}{3.6.9}\right)^2 + \dots - \infty.$$
(10)

- 5. Prove that if $f : [a, b] \to \mathbb{R}$ is continuous on [a, b], then f is Riemann-integrable on [a, b]. (10)
- 6. a) If $c \in (a, b)$ and $f: [a, b] \to \mathbb{R}$ is Riemann-integrable on [a, c] and on [c, b], then f is Riemann-integrable on [a, b]. (6)
 - b) Discuss the convergence of the integral $\int_{0}^{\infty} \sin u^2 du$. (4)
- 7. Prove that $B(x, y) = \frac{\Gamma(x)\Gamma(y)}{\Gamma(x+y)}$, where B(x, y) represents beta function and $\Gamma(x)$ represents Gamma function. (10)