 BCA (Sem-IV) – Mathematics

(405) GE-4

2024

Time : $1\frac{1}{2}$ *hours*

Full Marks : 40

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Answer from **both** *the sections as directed.*

Section–A

1. Answer any **four** questions of the following : 6×4=24

1. (a) (i) State order and completeness property of R.

(ii) Find the infimum of the sets (a,b) and $\left\{3+\frac{1}{n^2} : n \in N\right\}$.

(iii) Find the supremum of the sets [2,3] and $\left\{1+\frac{1}{n^2} : n \in N\right\}$

(b) State and prove Cauchy's general principle of convergence.

(c) Define convergent sequence. Prove that limit of a sequence, if it exists, is unique.

(d) State and prove Root test.

(e) Prove that every absolutely convergent series is convergent but the converse need not be true.

(f) State and prove Leibniz's test.

Section–B

Answer any **four** questions of the following :

4×4=16

2. (a) Show that the sequence $\left\{1+\frac{1}{n}\right\}$ converges to the limit 1.

(b) Using Cauchy's general principle of convergence, show that the sequence $\{a_n\}$ where $a_n = 1 + \frac{1}{2} + \frac{1}{3} + \ldots\ldots + \frac{1}{n}$ is not convergent.

(c) Test the convergence of the series

$$1 + \frac{1}{2^2} + \frac{1}{3^3} + \frac{1}{4^4} + \ldots\ldots + \frac{1}{n^n} + \ldots.\infty$$

(d) Show that the series $1 - \frac{1}{2} + \frac{1}{3} - \frac{1}{4} + \ldots\ldots\infty$ is conditionally convergent.

(e) Give examples of countable and uncountable sets.

(f) Give examples of convergent, divergent and oscillatory sequences and alternating series.

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