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**SIIS - N 72 A-15**  
**B.A./B.Sc. IInd Semester Degree Examination**  
**Mathematics**  
**(Algebra - II)**  
**Paper : 2.1**  
**(New)**

Time : 3 Hours

Maximum Marks : 60

**Instructions to Candidates:**

Answer All Sections

**SECTION - A**

**I** Answer any **TEN** questions.

**(10×2=20)**

1. Define convergent, Divergent and Oscillatory of a sequence.

2. Show that the sequence  $\left(\frac{2n-7}{3n+2}\right)$  is monotonic

3. Prove that every convergent sequence is bounded.

4. Find the limit of the sequence  $\sqrt{n}\{\sqrt{n+4} - \sqrt{n}\}$

5. State the Raab's Test of the series.

6. Discuss the convergence of the series  $\frac{1}{2} - \frac{1}{2^2} + \frac{1}{2^3} - \frac{1}{2^4} + \dots$

7. State the P-series Test

8. Discuss the convergence of the series

$$\frac{3}{7} + \frac{3}{7} \cdot \frac{6}{10} + \frac{3}{7} \cdot \frac{6}{10} \cdot \frac{9}{13} + \dots$$

9. Examine the convergence of the series

$$\frac{1}{5} + \frac{\sqrt{2}}{7} + \frac{\sqrt{3}}{9} + \frac{\sqrt{4}}{11} + \dots$$

10. In a Boolean Algebra prove that the compliment of every elements is unique.
11. Define conjunctive normal form.
12. Define switching function.

**SECTION - B**

**II.** Answer any **TWO** of the following.

**((2×5=10))**

13. If  $\lim_{n \rightarrow \infty} \{a_n\} = l$  and  $\lim_{n \rightarrow \infty} \{b_n\} = m$

Then  $\lim_{n \rightarrow \infty} [a_n \cdot b_n] = m \cdot l$

14. Prove that  $\lim_{n \rightarrow \infty} \left(1 + \frac{1}{n}\right)^n = e$

15. Prove that Every convergent sequence has a unique limit.

**SECTION - C**

**III.** Answer any **FOUR** of the following.

**(4×5=20)**

16. Show that the series  $\sum \frac{1}{n^p}$  is convergent if  $p > 1$  and divergent if  $p \leq 1$

17. If  $\sum U_n$  and  $\sum V_n$  are two series of +ve terms such that

i)  $\sum V_n$  is convergent

ii)  $U_n \leq K V_n$  for all 'n', where  $K > 0$ . Then prove that  $\sum U_n$  is also convergent

18. Discuss the convergence of the series  $\sum \left(\sqrt{\frac{n+1}{n^3+1}}\right) \cdot x^n$

19. State the cauchy's Root Test and Discuss the convergence of the series

$$\frac{2}{1^2}x + \frac{3^2}{2^3}x^2 + \frac{4^3}{3^4}x^3 + \dots$$

20. Sum to infinity the series

$$\frac{1}{15} + \frac{1.6}{15.30} + \frac{1.6.11}{15.30.45} + \dots$$

21. Examine the convergence absolute and conditionally convergence of the series.

$$1 - \frac{1}{2} + \frac{1}{3} - \frac{1}{4} + \dots$$

**SECTION - D**

IV. Answer any TWO of the following:

(2×5=10)

22. Find the conjuctive normal form of  $x^1 + yz$

23. Express  $(x+y)(x+y^1)(x^1+z)$  in DNF. Also find its, DNF in the variables  $x, y, z$ .

24. Simply the switching circuit.

