

**SIIS 72 A-2K14**

**B.A./B.Sc. IIInd Semester Degree Examination.....**  
**Mathematics**  
**(Algebra - II)**  
**Paper - 2.1**

Time : 3 Hours

Maximum Marks : 60

**Instructions to Candidates:-**

Answer all sections.

**Section - A**

I. Answer any Ten of the following **(10×2=20)**

- 1) Find the remainder when  $f(x) = x^2 - 2x + 7$  is divided by  $x - 1$
- 2) Find the roots of the equation  $x^3 - x^2 - 5x + 6 = 0$  by synthetic division.
- 3) Using Descartes rules of signs find the number of positive and negative roots of  $x^7 + 3x^5 - 4x^4 + 7x^2 - 4x - 3 = 0$ .
- 4) Increase the roots of the equation  $x^4 - 24x^2 - 13x + 35 = 0$  by 2.
- 5) Show that the sequence  $\left\{ \frac{n+3}{n+4} \right\}$  are monotonic sequence.
- 6) Test the convergence of the sequence  $n[\log(n+1) - \log n]$ .
- 7) Test the convergence of the sequence  $\frac{n+(-1)^n}{n}$
- 8) Discuss the boundedness of the sequence  $\frac{2n+3}{3n+4}$
- 9) State D'Alembert's ratio test
- 10) Test the convergence of the series  $\sqrt{n^2+1} - \sqrt{n}$
- 11) Test the convergence of the  $\sum \cos \frac{1}{n}$
- 12) Discuss the convergence of the series  $1 - \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{3}} - \frac{1}{\sqrt{4}} + \dots$

**Section - B**

**II.** Answer any **two** of the following **(2×5=10)**

- 1) Solve the Equation  $8x^3 - 6x^2 - 3x + 1 = 0$  given that the roots are in H.P.
- 2) Using Descartes rule of sign's find the nature of the roots  $x^9 - 5x^5 - 6x^4 - 7x^2 - 5 = 0$ .
- 3) Solve the Equation  $x^3 - 27x + 54 = 0$  by Cardon's method.

**Section - C**

**III.** Answer any **three** of the following **(3×5=15)**

- 1) If two sequence  $\{x_n\}$  and  $\{y_n\}$  are convergent and converges to  $l$  and  $m$  then prove that  $\lim_{n \rightarrow \infty} (x_n - y_n) = l - m$
- 2) Show that the sequence  $\{x_n\}$  where  $x_n = \frac{1}{1!} + \frac{1}{2!} + \dots + \frac{1}{n!}$  is convergent.
- 3) Prove that the sequence  $\{x_n\}$  where  $x_1 = 1$  and  $x_n = \sqrt{7+x_{n-1}} \forall n, n \geq 7$  is convergent and converges to 7
- 4) Find the limit of the sequence 0.7, 0.77, 0.777 ----- .

**Section - D**

**IV.** Answer any **three** of the following **(3×5=15)**

- 1) State and prove Cauchy's Root test.
- 2) Examine the convergence of the series  $\frac{x}{1.3} + \frac{x^2}{3.5} + \frac{x^3}{5.7} + \dots$
- 3) Test the convergence of the series  $\frac{1.2}{3.4.5} + \frac{2.3}{4.5.6} + \frac{3.4}{5.6.7} + \dots + \infty$
- 4) Discuss the convergence of the series  $\sum \frac{1.5.9 \dots (4n-3)}{3.7.11 \dots (4n-1)}$