[This question paper contains 3 printed pages.]

5231 *Your Roll No.* .....

B.A. (Hon.) Programme **B**

Discipline Centred Concurrent Course – Economics

(For Economics Hons.)

(Maths : Elements of Analysis)

(Admissions of 2005 and onwards)

Time : 2 Hours *Maximum Marks : 38*

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt any **two** *questions from each section.*

SECTION A

1. (a) Define Supremum and infimum of a set of real numbers. Give an example of a set whose Supremum and infimum do not belong to it. (2+2)

   (b) If $\langle a_n \rangle \to 0$ and $\langle b_n \rangle$ is bounded. Prove that $\langle a_n b_n \rangle \to 0$. (4)

2. State Cauchy's 2nd theorem on limits

   Prove $\lim \left\{ \frac{\lfloor 2n}{\left(\lfloor n\right)^2} \right\}^{\frac{1}{n}} = 4$. (2+6)

P.T.O.

3. Define $\langle a_n \rangle$ as :

$$a_1 = 8, \quad a_{n+1} = 2 + \frac{1}{2} a_n$$

Show that $\langle a_n \rangle$ is monotonic and bounded. Also find its limit. (6+2)

SECTION B

4. Test the following Series for convergence or divergence :

(i) $\sum_{x=1}^{\infty} \frac{1}{\sqrt{x} + \sqrt{x+1}}$

(ii) $\sum_{x=1}^{\infty} \frac{x^{x^2}}{(x+1)^{x^2}}$ (3+3)

5. Test the convergence of the following Series :

(i) $\sum_{x=1}^{\infty} \frac{5^x}{x^2 + 5}$

(ii) $\frac{1}{5} + \frac{2!}{5^2} + \frac{3!}{5^3} + \frac{4!}{5^4} + - - - - -$ (3+3)

6. Test for convergence and absolute convergence of the following Series :

(i) $\sum_{x=1}^{\infty} \frac{(-1)^{x-1}}{x\sqrt{x}}$

(ii) $\frac{1}{1\cdot2} - \frac{1}{3\cdot4} + \frac{1}{5\cdot6} - \frac{1}{7\cdot8} + \text{- - - - -}$ (3+3)

SECTION C

7. Define Power Series and its radius of convergence. Determine the radius of convergence and the exact interval of convergence of the following power series :–

$$\sum \frac{(n+1)\,x^n}{(n+2)(n+3)} \qquad (5)$$

8. Show that

$$\tan^{-1} x = x - \frac{x^3}{3} + \frac{x^5}{5} - \frac{x^7}{7} + \text{- - -}$$

$$-1 \le x \le 1 \qquad (5)$$

9. Write down the power series expansion of e^x. (5)