Roll No. .......................

# 97603

## B.C.A 1st Semester (Old) Examination–December, 2012

### Mathematics-II

### Paper : BCA-103

*Time : 3 hours* *Max. Marks : 75*

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard will be entertained after the examination.

**Note :** Attempt any **five** questions in all. All questions carry equal marks.

**1.** (a) Define adjoint (A) for any given matrix A = (aij) which is non singular and is of order n. Also prove that :

(i) $|\text{adj}(A)| = |A|^{n-1}$

(ii) $\text{adj}(\text{adj}(A)) = |A|^{n-2} \cdot A$

(b) For what values of x and y the following matrices A and B are equal ?

$$A = \begin{bmatrix} (2x+1) & 3y \\ 0 & (y^2 - 5y) \end{bmatrix} \quad B = \begin{bmatrix} (x+3) & (y^2+2 \\ 0 & -6 \end{bmatrix}$$

**2.** (a) Show without expanding :

$$\begin{vmatrix} +a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix} = (a+b+c)^3$$

(b) Find the area of a triangle whose vertices are (–3, 1), (5, 3), (–2, –3).

**3.** (a) Find the coefficient of $x^6$ in the expansion of $\left(3x^2 - \frac{1}{3x}\right)^9$.

(b) In an examination 7 candidates have to appear, 3 in Mathematics and rest in other subjects. In how many ways can they be seated if the candidates appearing in Mathematics are not to be seated together.

4. (a) Prove that interior of a set is the largest open set contained in it.

(b) Find the g.*l*.b. and *l*.u.b. of the following sets, if exists :

(i) $\left\{\frac{(-1)^n}{2^n};\ n \in N\right\}$

(ii) $\left\{\frac{3n+2}{2n+1};\ n \in N\right\}$

(c) If $a_n = \frac{\lfloor n}{n^n}$, prove that $<a_n>$ is a null sequence.

5. Discuss the convergence or divergence of the following series :

(i) $\frac{1}{\sqrt{1}+\sqrt{2}} + \frac{1}{\sqrt{2}+\sqrt{3}} + \frac{1}{\sqrt{3}+\sqrt{4}} + \ldots..$

(ii) $1 + \frac{1}{2^2} + \frac{1}{3^3} + \frac{1}{4^4} + \ldots\ldots.$

6. Examine the convergence of the series :

(i) $x^2 + \frac{2^2}{3.4}x^4 + \frac{2^2.4^2}{3.4.5.6}x^6 + \frac{2^2.4^2.6^2}{3.4.5.6.7.8}x^8 + \ldots$

(ii) $\sum_{n=1}^{\infty} \frac{1}{n \log n}$

7. (a) Find the value upto fourth decimal place for $y = 3.(4.02)^2 - 2(4.02)^{3/2} + 8/\sqrt{4.02}$.

(b) Obtain Maclaurin series expansion of :

$$f(x) = \frac{1}{1 + x - 2x^2}$$

8. (a) Prove that :

$$-x < \sin^{-1} x < \frac{x}{\sqrt{1 - x^2}}; \quad 0 < x < 1$$

(b) Determine the values of a and b so that :

$$\lim_{x \to 0} \frac{a\, e^x + e^{-x} - b \cos x}{x \sin x} = 2$$

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