V.P.& R.P.T.P SCIENCE COLLEGE
Internal Test B.Sc.Semester- III
Subject : Mathematics (US03EMTH05)
Calculus and Algebra-I

Date : 14/10/2014 **Time : 2 p.m to 3 p.m.**
Tuesday **Total marks : 25**

Q-1 Attempt the following 3

1. $\log \infty =$.....
   (a) 1 (b) 0 (c) ∞ (d) $-\infty$

2. If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ & $B = \begin{bmatrix} 3 & 5 \\ 6 & 4 \\ 0 & 7 \end{bmatrix}$ then $BA =$ .....
   (a) Not possible (b) $\begin{bmatrix} 18 & 26 \\ 18 & 28 \\ 21 & 28 \end{bmatrix}$ (c) $\begin{bmatrix} 18 & 26 \\ 18 & 28 \end{bmatrix}$ (d) $\begin{bmatrix} 18 & 28 \\ 21 & 18 \end{bmatrix}$

3. If A is skew hermitian matrix then .....
   (a) $A^\theta = A$ (b) $A^\theta = -(\overline{A})'$ (c) $A^\theta = (\overline{A})'$ (d) $A^\theta = -A'$

Q-2 Attempt the following. (Any two) 4

1. Find $\lim_{x \to 0} \dfrac{\log(\sin x)}{\cot x}$
2. If A is Hermitian matrix then prove that iA is a Skew hermitian matrix.
3. Define Determinant and Minor of matrix with example.

Q-3 Find a,b,c for which $\lim_{x \to 0} \dfrac{ae^x - 2b\cos x + 3ce^{-x}}{x \sin x} = 2$ 6

OR

Q-3 [A] Find $\lim_{x \to 0} (\cot x)^{\sin 2x}$ 3

[B] Find $\lim_{x \to 0} \left(\dfrac{1}{2x^2} - \dfrac{\cot^2 x}{2} \right)$ 3

Q-4 Prove that Every square matrix can be expressed in one and only one way as the sum of a symmetric and skew symmetric matrix. 6

OR

Q-4 [A] If $A = \begin{bmatrix} -2 & -1 \\ 1 & 0 \\ 3 & -4 \end{bmatrix}; B = \begin{bmatrix} 0 & 3 \\ 2 & 0 \\ -4 & -1 \end{bmatrix}$ and 2x+3A=B then find x. 3

[B] If A and B both are symmetric matrices then prove that AB is also symmetric matrix iff A and B are commute. 3

Q-5 State and prove Cayley hamilton theorem.Also verify it for the matrix $A = \begin{bmatrix} 4 & 2 \\ -1 & 1 \end{bmatrix}$ 6

OR

Q-5 [A] If $A = \begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix}$ then find $A^2 - 4A + 5I$. 3

[B] If $A = \begin{bmatrix} 2 & 3 \\ 1 & 4 \end{bmatrix}$ then find characteristic matrix and characteristic equation of A. 3

ALL THE BEST