Model Paper – 2
Hi-Tech Institute of Engineering & Technology
B.C.A. Examination
(Semester-Iˢᵗ) Odd Semester
Mathematics-1
(BCA-101)

Time: 3 Hours   **Maximum Marks: 75**
Faculty Name: Mr. Vivek Gupta
Note: Attempt questions from all sections as per instructions.

Section – A

Note: Attempt all questions.   5 x 3 = 15
1. Given $\vec{a}=\hat{i}+3\hat{j}-2\hat{k}$ and $\vec{b}=-\hat{j}+3\hat{k}$ find $\vec{a}.\vec{b}$.
2. Evaluate: $\int x^2 e^x dx$.
3. Evaluate; $\lim_{x\to 0} x\sin(\frac{1}{x})$.
4. **Define Continuity at a point.**
5. State Caley Hamilton theorem.

Section – B

Note: Attempt any two questions.   2 x 7.5 = 15

6. Evaluate; $\lim_{x\to 0}(\frac{x-Sinx}{x^3})$.
7. Find the Eigen Values (Characteristic roots) of the matrix:
   $A=\begin{bmatrix} a & h & g \\ 0 & b & f \\ 0 & 0 & c \end{bmatrix}$
8. Show that $A=\frac{1}{3}\begin{bmatrix} -1 & 2 & 2 \\ 2 & -1 & 2 \\ 2 & 2 & -1 \end{bmatrix}$ is Orthogonal.

Section – C

Note: Attempt any three questions.   3 x 15 = 45

9. **Prove that** $\begin{vmatrix} 1 & a & a^3 \\ 1 & b & b^3 \\ 1 & c & c^3 \end{vmatrix}$ **= (a-b)(b-c)(c-a)(a+b+c).**
10. Find the derivative with respect to x
    (a) $\log_a x$ (b) log[log(logx)].
11. Verify Calyey – Hamilton theorem for the matrix:
    $A=\begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$

    Also determine the characteristic roots and corresponding characteristic vector of the matrix A.

12. Find the inverse of matrix $A=\begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$.

13. Expand logx in power of (x-1) by taylor's theorem.