

9/2/2013

**Birla Institute of Technology & Science, Pilani**  
**Work-Integrated Learning Programmes Division**  
**Second Semester 2012-2013**

**Mid-Semester 2012-2013**  
**(EC-2 Regular)**

Course Name	: MATH ZC161	
Course Title	: Engineering Mathematics - I	
Nature of Exam	: Closed Book	
Weightage	: 35%	
Duration	: 2 Hours	No. of Pages = 01
Date of Exam	: 09/02/2013 (AN)	No. of Questions = 05

Note:

1. Please follow all the Instructions to Candidates given on the cover page of the answer book.
2. All parts of a question should be answered consecutively. Each answer should start from a fresh page.
3. Assumptions made if any, should be stated clearly at the beginning of your answer.

✓ Q. 1. Suppose  $A = \begin{pmatrix} 2 & 1 \\ 6 & 3 \\ 2 & 5 \end{pmatrix}$ . Show that the matrix  $B = AA^T$  is symmetric. [6]

✓ Q. 2. Solve the following system of equations by Cramer's rule

$$x_1 - 2x_2 - 3x_3 = 3$$

$$x_1 + x_2 - x_3 = 5$$

$$3x_1 + 2x_2 = -4. \quad [8]$$

✓ Q. 3. Find the eigenvalues and eigenvectors of the matrix  $A = \begin{pmatrix} 4 & 8 \\ 0 & -5 \end{pmatrix}$ . [7]

✓ Q. 4(a). Evaluate the following limit:

$$\lim_{x \rightarrow 1} \frac{x^2 + x - 2}{x^2 - x} \quad [4]$$

(b). Find  $\frac{dy}{dx}$  where  $y = \frac{x^2 + \sin x}{x^3 + \cos x}$ . [4]

Q. 5. Evaluate the following integral:

$$\int \frac{x+4}{x^3 + 3x^2 - 10x} dx. \quad [6]$$

$$-20 - 4x + 5x + x^2$$

$$\begin{array}{r} 42 \\ 14 \\ \hline 28 \\ \hline 2 \end{array}$$

$$\begin{array}{r} 42 \\ 14 \\ \hline \end{array}$$

$$\begin{pmatrix} 9 & 6 & 10 \\ 0 & 0 & 01 \end{pmatrix}$$

$$\begin{array}{r} 1 \\ 14 \\ 38 \\ 3 \\ \hline 55 \end{array}$$

$$\begin{array}{r} 57 \\ 13 \\ \hline 44 \end{array}$$