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SECOND SEMESTER **B.Tech. (ALL)**

MID SEMESTER EXAMINATION ***MARCH-2012***

AM-111 MATHEMATICS II

Time: 1 Hour 30 Minutes ***Max. Marks : 20***

Note : Answer *ALL* questions selecting any *TWO* parts from each.
Assume suitable missing data, if any.

1[a] Define rank of a matrix. Find the rank of the matrix.

$$A = \begin{bmatrix} 1 & 2 & 3 & 0 \\ 2 & 4 & 3 & 2 \\ 3 & 2 & 1 & 3 \\ 6 & 8 & 7 & 5 \end{bmatrix}$$

[b] Show that the matrix $A = \begin{bmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$ is diagonalizable. Obtain the diagonalizing matrix P.

[c] State Cayley Hamilton theorem. Verify this theorem for the matrix $\begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$ and hence find its inverse. 7

2[a] Solve the following differential equations:

(i) $\frac{d^2y}{dx^2} + a^2y = secax$

(ii) $\frac{d^2y}{dx^2} - 4y = xsinhx$

[b] Solve $x^2\frac{d^2y}{dx^2} + 4x\frac{dy}{dx} + 2y = e^x$

[c] Solve the following system of differential equations

$\frac{dx}{dt} + 5x - 2y = t$

$\frac{dy}{dt} + 2x + y = 0,$ $x = y = 0$ *when* $t = 0.$ 6

3[a] Solve in series the differential equation

$$\frac{d^2y}{dx^2} + xy = 0$$

[b] Obtain the series solution of the equation

$$x(1-x)\frac{d^2y}{dx^2} - (1+3x)\frac{dy}{dx} - y = 0$$

[c] Obtain the series solution of the equation

$xy'' + y' + xy = 0$ 7

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