Government Engineering College, Bakhtiyarpur, Buxar & Bhojpur

Assignment (Mathematics)

Branches: EE, EC, IN & EEE of 2nd sem.

Answer all Questions.

1. (a) Find the Eigen values and Eigen vectors of

$$\begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$$

(b) State and Prove Cayley-Hamilton theorem and using this theorem Find the matrix represented by $A^8 - 5A^7 + 7A^6 - 3A^5 + A^4 - 5A^3 + 8A^2 - 2A + I$,

where $A = \begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$

2. (a) Solve $(x^7y^2 + 3y)dx + (3x^8y - x)dy = 0$

(b) Solve $(D^2 + 3D + 2)y = e^{e^x}$

(c) By using method of Variation of Parameters solve
$(D^3 - 6D^2 + 12D - 8)y = \frac{e^{2x}}{x}$

3 (a) Find $L^{-1}\left\{\frac{1}{(s^2+4)(s+1)^2}\right\}$ by using Convolution theorem.

(b) By using Laplace transform technique solve

$y'' + 9y = \cos 2t$, $y(0) = 1$, $y(\pi/2) = -1$

4 (a) Obtain Simpson's $\frac{1}{3}$rd rule for numerical Integration.

(b) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ by using

(i) Trapezoidal rule (ii) Simpson's $\frac{1}{3}$rd rule (iii) Simpson's $\frac{3}{8}$th rule

and Compare the results with its actual value.

5 (a) Using Runge-Kutta method of 4th order, compute $y(0.2)$ and $y(0.4)$ from $\frac{dy}{dx} = \frac{x^2+y^2}{10}$, $y(0) = 1$, taking $h = 0.1$.

(b) Using Picard's method find approximate values of y and z corresponding to $x = 0.1$, given that $y(0) = 2$, $z(0) = 1$ and $\frac{dy}{dx} = x + z$ and

$$\frac{dz}{dx} = x - y^2$$