

SET - A

1.

- a. Construct the associated differential equation of charging the capacitor (RC circuit). Find the fixed point(s) of this circuit. What do they (does it) signify? How can you map the fixed points with your exact solution (if it exists)? Take the value of the capacitor as C , value of the resistor as R , and Voltage as V_0 . [5 marks]
- b. Solve the Initial value problem $x' = x + y$, $y' = 4x - 2y$, subject to the initial condition $(x_0, y_0) = (2, -3)$ [5 marks]

2. Explain the Euler method that is used to solve (numerically) first order ordinary differential equations.

[5 marks]

3. Find the eigenvalues and eigenvectors of A , A^2 , A^{-1} and $A+4I$

[8 marks]

$$A = \begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix} \text{ and } A^2 = \begin{bmatrix} 5 & -4 \\ -4 & 5 \end{bmatrix}$$

check the trace (of A) $\lambda_1 + \lambda_2 = 4$ and $\lambda_1 \lambda_2 = 3$.

[2 marks]