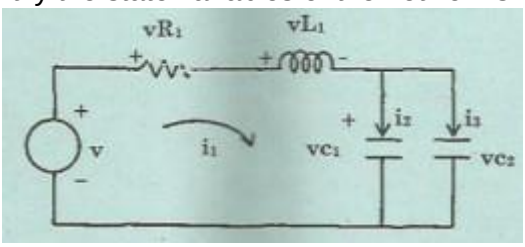
IN 5152 System Theory

Important 2 Marks Questions

Unit I

1. Define state of a system.
2. List the properties of the state transition matrix.
3. Define state and state variables.
4. What is bush form or companion from of a matrix?
5. Test the time invariance and linearity of the following state equation.$x(t) = 2x(t) + u(t)$.
6. Identify the state variables of the network shown in figure



7. List the drawbacks in transfer function model analysis?
8. Define the term (i) linearity (ii) Time invariance.
9. Express the formula in which the general form of state space model into transfer functional approach.
10. Explain the applications of state space model for the different system.

Unit II

1. Draw the block diagram representation of the state model of a linear multi input multi output system.
2. What are the properties of Jordan canonical matrix?
3. Define controllability and observability.
4. Compute state transition matrix for a system with state equation X=AX.
5. Find the solution vector for a set of homogeneous equations and state the condition for linear relation.
6. What is the state transition matrix? List any two methods for finding state transition matrix.
7. What is eigen values and eigen vectors? Examine how the eigen values can be calculated?
8. Describe the formula for Matrix exponential method.
9. Estimate the transformed canonical state model of a system?
10. Demonstrate how the modal matrix can be determined?

Unit III

1. Define controllability and observability of the system.
2. What is duality property of a given system?
3. List the properties of state transition matrix.
4. Obtain the transfer function from state model.

5. Justify the statement, “state controllable system is also output controllable”.
6. With Jordan canonical form, state the condition for complete controllability.
7. Quote what is meant by the rank of the matrix?
8. Examine the need for observability test?
9. Summarize the condition for controllability by Glibert’s method.
10. Discuss the effect of pole zero cancellation in transfer function approach.

Unit IV

1. Obtain the transfer function from a linear difference equation with state model.
2. How is the state transition matrix computed?
3. Define Sylvester’s theorem.
4. Define Liapunov’s stability criterion.
5. Identify a Lyapunov’s function to access the stability of the following system. $x = 2x$.
6. State the condition for asymptotic stability in the sense of Lyapunov.
7. Define singular point of an autonomous system.
8. Draw the phase trajectory of the system with nonlinear damping, described by the differential equation $\ddot{x} + |x|\dot{x} + 4x = 0$
9. Define the term Pole placement of controller.
10. Analyze the need for state observer for the system?

Unit V

1. With state equation, draw the block diagram of a linear system with state observer.
2. Write a note on the pole placement by state feed back for a sampled data system.
3. What are the modes that cannot be shifted by state feedback? Explain.
4. Distinguish the use of full and reduced order observers.
5. Draw the block diagram of a linear system with state observer.
6. With reference to the controllability and observability of the system, what is the impact of pole zero cancellation in transfer function.
7. Consider a nonlinear system governed by the equation $x_1 = -x_1 + 2x_1^2x_2$, $x_2 = -x_2$. Check the stability of the system using Lyapunov method.
8. Evaluate the concept of equilibrium points?
9. What is the procedure to formulate a Lyapunov function to check the stability of the system?
10. Define positive semi definiteness of scalar functions. Give an example?