JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION- 2025

B.Tech-5th Semester (ECE)

COURSE CODE (CREDITS): 18B1WEC534 MAX. MARKS: 25

COURSE NAME: NETWORK ANALYSIS AND SYNTHESIS

COURSE INSTRUCTORS: Dr Rajiv Kumar MAX. TIME: 1 Hour 30 Min

Note: (a) All questions are compulsory.

(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

(c) The calculator (non-programmable) is allowed to use in examination.

Q.No	Question	CO	Marks
Q1	a) Explain the significance of transmission (ABCD) parameters in analyzing two-port networks. How do these parameters relate to the inverse transmission parameters? b) A two-port network has the following transmission parameters: $A = 2, \quad B = 50\,\Omega, \quad C = 0.02\,\text{S}, \quad D = 1.5$ Verify that A′D′−B′C′=1	CO-4	5
Q2	a) For a two-port reciprocal network, show the relationship between Z-parameters and Y-parameters. Discuss under what conditions $Z_{12} = Z_{21}$ and $Y_{12} = Y_{21}$ b) Explain why Z-parameters and Y-parameters are inverses of each other for a two-port network.	CO-4	3+2=5
Q3	Explain the fundamental differences between state-space representation and transfer function representation of a system. Discuss how each method represents system dynamics and specify the	CO-3	5

	advantages of using the state-space approach system design.		
Q4	Consider the second-order linear constant-coefficient differential equation $$y''(t) + a_1 y'(t) + a_0 y(t) = b_0 u(t)$$ where u(t) is the input and y(t) the output. (a) Formulate a (continuous-time) state-space model in controllable canonical form. (b) Using that state-space model, derive the transfer function	CO-3	5
Q5	Consider a continuous-time linear system represented in state-space form. Let the state and output vectors are: $$\dot{X}(t) = \begin{bmatrix} -2 & 1 \\ 0 & -3 \end{bmatrix} X(t) + \begin{bmatrix} 1 \\ 2 \end{bmatrix} U(t), \quad X(0) = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$$ $$Y(t) = [1\ 0] X(t)$$ Obtain the time response of the state vector X(t) when the input U(t) is a unit step. Also, determine the output response for the same input.	CO3	5