

Medium

Deputy Executive Engineer (Electric)

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ports Authority of Gujarat / Assistant Engineer (El

Consider the following statements regarding State Variable Analysis: 1. State variables define system dynamics completely. 2. State-space model can represent

A

All of the above

B

1 and 3 only

C

2 and 3 only

D

1, 2 and 4 only

Correct

Correct Answer: D

Full Detailed Explanation

Correct Answer: D - 1, 2 and 4 only Quick Concept Explanation A state-space model represents internal dynamics using a minimal set of state variables. It naturally handles MIMO systems and incorporates initial conditions. Key relation: $\dot{x} = Ax + Bu$; $y = Cx + Du$. Exam focus: Eigenvalues of A are the state-model characteristic roots. Common trap: Output is not generally independent of state variables. Statement-wise Verification Statement 1 - Correct. State variables define system dynamics completely. A state-space model represents internal dynamics using a minimal set of state variables. Statement 2 - Correct. State-space model can represent MIMO systems. A state-space model represents internal dynamics using a minimal set of state variables. Statement 3 - Incorrect. Transfer function can always be uniquely obtained from state model. A transfer function is an input-output description; different state realizations can represent the same transfer function, and internal-state information is not unique from the transfer function Statement 4 - Correct. State model includes initial conditions. Eigenvalues of A are the state-model characteristic roots. Core Concept A state-space model represents internal dynamics using a minimal set of state variables. It naturally handles MIMO systems and incorporates initial conditions. Stability of a continuous-time LTI model is tied to eigenvalues of A: