G 1450

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B.TECH. DEGREE EXAMINATION, MAY 2016

Sixth Semester

Branch : Applied Electronics and Instrumentation/Electronics and Instrumentation Engineering

AI 010 605/EI 010 605—CONTROL ENGINEERING—II (AI, EI)

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours

Maximum : 100 Marks

Part A

Answer all questions.
Each question carries 3 marks.

1. Define Eigen values and eigen vectors of a matrix.

2. List the properties of state transition matrix.

3. Define the terms controllability and observability.

4. Compare zero order and first order hold.

5. Write the classification of Singular Points.

(5 × 3 = 15 marks)

Part B

Answer all questions.
Each question carries 5 marks.

6. Obtain the state model for the system described by $y(k+3) + 3y(k+2) + 2y(k+1) + y(k) = 5\,u(k)$.

7. Find the state transition matrix for $X = \begin{bmatrix} 0 & 2 \\ -1 & -2 \end{bmatrix} X$.

8. Explain the structure and properties of Observers.

9. Write the relationship between Z and S domain.

10. Explain the stability of non-linear systems.

(5 × 5 = 25 marks)

Turn over

Part C

Answer all questions.
Each question carries 12 marks.

11. Obtain the state model of the system whose transfer function is given by :

$$\frac{Y(s)}{U(s)} = \frac{10}{s^3 + 4s^2 + 2s + 1}.$$

Or

12. State and explain the Lagrange's equation with an appropriate illustration.

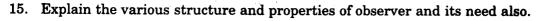13. Define state transition matrix and derive an expression to obtain the state transition matrix from state matrix.

Or

14. The state model of a discrete time system is given by

$$X(k+1) = AX(k) + BU(k)$$
$$Y(k) = CX(k) + DU(k).$$

Determine its transfer function.

15. Explain the various structure and properties of observer and its need also.

Or

16. Consider a linear system described by transfer function $\dfrac{Y(s)}{U(s)} = \dfrac{10}{s(s+1)(s+2)}.$ Design a feedback controller with a state feedback so that the closed-loop poles are placed $-2, -1 \pm j1$.

17. Check for stability of the sampled data control system represented by the following characteristic equation by Jury's stability test :

  (i) $5z^2 - 2z + 2 = 0.$

  (ii) $z^3 - 0.2z^2 - 0.25z + 0.05 = 0.$

Or

18. List out the various properties of Z transform and prove that property.

19. Explain about the behavior of nonlinear system with suitable example.

Or

20. What is meant by limit cycle and explain the method to determine the frequency and amplitude of limit cycle ?

(5 × 12 = 60 marks)