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Question Paper Code : 31482

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2013.

Seventh Semester

Instrumentation and Control Engineering

IC 2401 /IC 71/10133 IC 701 — DIGITAL CONTROL SYSTEM

(Common to IC 71 Digital Control System for Electronics and Instrumentation Engineering)

(Regulation 2008/2010)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Draw the block diagram of general sampled data control system.

2. Mention the advantages of using Digital control system.

3. Explain the various forms of sampling.

4. What is an ideal sample?

5. Find $F(z)$ for $f(t)=t.e^{-at}$ where $t \geq 0$.

6. What is a steady state error?

7. Define transfer function.

8. State Cayley Hamilton technique.

9. What is state regulator design?

10. Mention the characteristics of deadbeat response.

PART B — (5 × 16 = 80 marks)

11. (a) Describe the signal classifications of a control system in detail. (16)

Or

(b) Illustrate and explain the discrete data and digital control system. (16)

12. (a) Write a note on sampling and Shanon' s sampling theorem. (16)

Or

(b) Illustrate and describe the data reconstruction process. (16)

13. (a) What are the various properties of the Z-Transform? Explain the mapping between s and z domains. (16)

Or

(b) Describe the :

(i) Steady state error analysis for stable systems and

(ii) Jury's stability test in detail. (16)

14. (a) A discrete time system has state equation given by $X(k+1)=\begin{bmatrix} 0 & 1 \\ -10 & -7 \end{bmatrix}.X(k)$ Use Cayley Hamilton approach to find out its state transition matrix. (16)

Or

(b) A discrete time system has transfer function $T(z)=\frac{4z^3-12z^2+13z-7}{(z-1)^2(z-2)}$.

Determine state model in (i) phase variable form and (ii) Jordan canonical form. (16)

15. (a) Derive the position and velocity forms of a digital PID controller with neat illustration. (16)

Or

(b) Illustrate and explain the process of dead beat control by state feedback. (16)
