G 6030

M.E. DEGREE EXAMINATION, MAY/JUNE 2007.

Second Semester

Applied Electronics

AN 1653 — DIGITAL CONTROL ENGINEERING

(Regulation 2005)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Distinguish between continuous time PID controller and digital PID controller.

2. Draw the block diagram of unit feed back system.

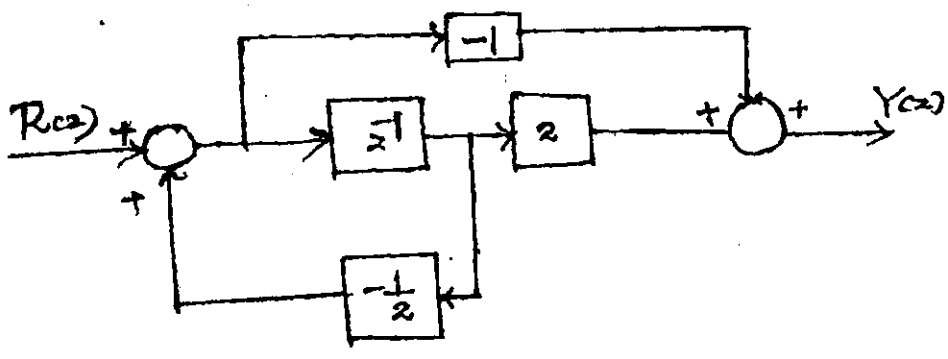
3. What is meant by frequency folding? And how is it avoided?

4. Draw the structure for a discrete – time system, described by the transfer function.

$$G(z) = \frac{Y(z)}{R(z)} = \frac{0.022}{z - 1}.$$

5. State BIBO stability and given an example.

6. Consider the discrete-time system shown in fig, obtain it's transfer function :



7. What type of system is refered to as dead beat control system.

8. Write the control algorithm for the given transfer function :

$$D(z) = \frac{0.3 + 0.25z^{-1}}{1 + 0.6z^{-1}} = \frac{L(z)}{E(z)}.$$

9. What is finite word length effect?

10. What is ringing poles? And what is the advantage of micro controller over microprocessor?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Obtain the transfer function of a zero order hold. (4)

(ii) What is continuous time compensation? And explain the PI controller in detail. (2 + 10)

Or

(b) (i) Draw the generalized operational block diagram of a feed back system and explain the basic elements. (6)

(ii) Explain in detail about digital control algorithms PID. (10)

12. (a) (i) State and explain the sampling theorem. (6)

(ii) Explain the operation of first order hold circuit. (10)

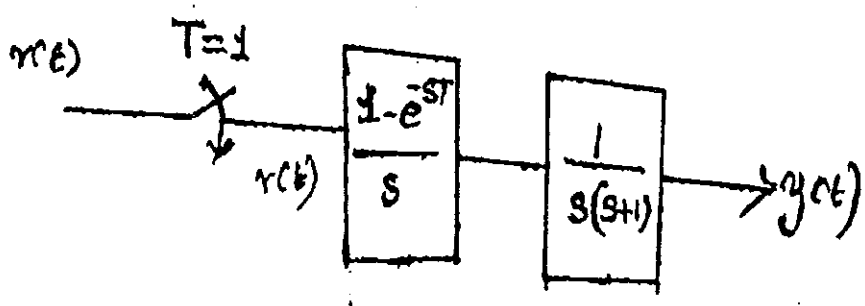
Or

(b) (i) Obtain the difference equation of a first order system. (8)

(ii) Explain the various practical aspects of the choice of samplginr rate and briefly explain about reconstruction. (6 + 2 = 8)

13. (a) (i) Construct the Jury table and test the system whether it is stable or not, whose characteristic polynomial is $\Delta(z) = 2z^4 + 7z^3 + 10z^2 + 4z + 1$. (4)

(ii) Find the response of the system shown in fig to a unit impulse input : (12)



Or

(b) Realize the given transfer function in first companion form, second companion form and Jordan canonical form and also draw the signal flow graph and state diagram

$$\frac{Y(s)}{L(s)} = G(s) = \frac{s+3}{s^3+9s^2+24s+20}. \quad (16)$$

14. (a) Explain the z-plane specifications of control system design for various types. (16)

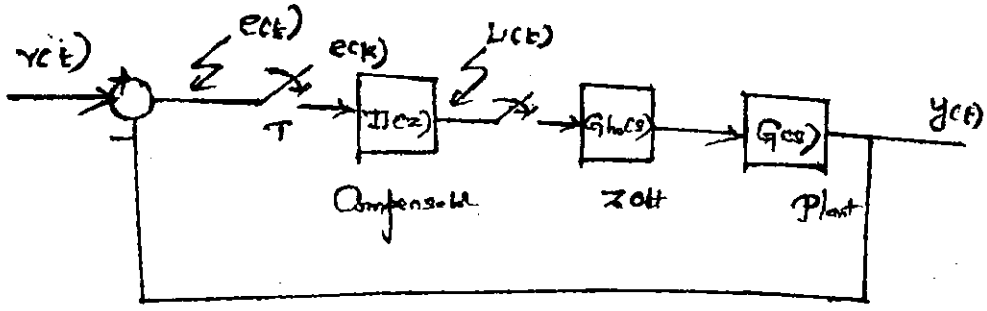
Or

(b) Design a digital control scheme for the system shown in Fig. to meet following specification :

(i) The velocity error constant $K_v \geq 10$

(ii) Peak overshoot M_p to step input $\leq 25\%$ and

(iii) Settling time is (2% tolerance bond) ≤ 2.5 sec .



where $G(s) = \frac{K}{S(s+5)}$. (16)

15. (a) With block diagram explain a micro controller based digital speed control system for a DC motor. (16)

Or

(b) Draw the block diagram of micro controller based temperature control system and explain with its control algorithm. (16)