Code: 9A13501

R09

B.Tech IV Year II Semester (R09) Advanced Supplementary Examinations, July 2013

DIGITAL CONTROL SYSTEMS

(Electronics and Instrumentation Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) With the help of schematic diagram, explain the principle of operation of analog to digital conversion.

(b) What is sampling? Explain the conditions to be satisfied for reconstruction of sampled signal into continuous signal.

2 (a) Find the inverse Z-transform of the following:

(i) $F(Z) = \frac{(Z-4)}{(Z-1)(Z-2)^2}$

(ii) $F(Z) = \frac{3Z^2+2Z+1}{Z^2-3Z+2}$

(b) State and prove initial and final value theorems.

3 Obtain the closed loop pulse transfer function of the following system configuration shown below in figure(1):

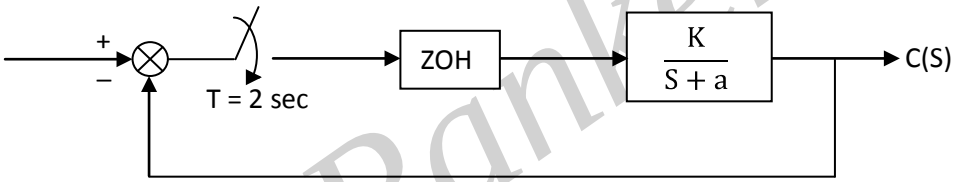

Figure (1)

4 Obtain a state space representation of the following pulse transfer function such that the state transition matrix is in diagonal form $\frac{Y(S)}{U(S)} = \frac{Z^3+8Z^2+17Z+8}{(Z+1)(Z+2)(Z+3)}$. Also obtain the initial state $X(0)$ in terms of $y(0), y(1), y(2)$ and $u(0), u(1), u(2)$.

5 (a) Define controllability and observability of discrete time systems.

(b) Investigate the controllability and observability of the following system:

$$\frac{Y(S)}{U(S)} = \frac{Z^{-1}(1+0.8Z^{-1})}{1+1.3Z^{-1}+0.4Z^{-2}}$$

6 (a) Explain briefly the stability analysis using bilinear transformation.

(b) Determine the stability of the system with the following transfer function by using bilinear transformation and Routh-Hurwitz test.

$$T(Z) = \frac{2Z^4-3Z^3+Z^2-3Z+4}{Z^4+0.6Z^3-0.7Z^2+0.8Z-0.9}$$

7 (a) Explain the transient response analysis of discrete data control system.

(b) Write short notes on the following as applied to discrete data control system:

(i) Lag compensator.

(ii) Digital PID controller.

8 (a) Explain the design of state feedback controller through pole placement method highlighting necessary and sufficient conditions.

(b) Explain the full order state observer.

*****