Exam.Code:0935
Sub. Code: 6669

2074

B.E. (Electrical and Electronics Engineering)

Fifth Semester

PC-EE-502: Control Engineering - II

Time allowed: 3 Hours **Max. Marks: 50**

NOTE: Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Part. Missing data (if any) can be appropriately assumed.

x-x-x

Q1. Explain in brief.

A) Mention the need for state variables. **(02)**

B) Obtain the correlation between a proportional plus derivative controller and a lead compensator. **(02)**

C) What is the significance of integral controller and derivative controller in a PID controller? **(02)**

D) Will the controllability be affected by sampling? Explain. **(02)**

E) Write the transfer function of lag compensator and draw its pole-zero plots? **(02)**

Part A

Q2. A) Check or observability of a system having following coefficient matrices using Kalman's test. **(05)**

B) Derive relationships between controllability, observability and transfer function. **(05)**

Q3. A) Determine the state controllability and observability of the system described by **(05)**

$$\dot{X} = \begin{bmatrix} -3 & 1 & 1 \\ -1 & 0 & 1 \\ 0 & 0 & 1 \end{bmatrix} X + \begin{bmatrix} 0 & 1 \\ 0 & 0 \\ 2 & 1 \end{bmatrix} u \; ; \quad Y = \begin{bmatrix} 0 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix} X$$

B) Discuss Ziegler-Nichols tuning rules for tuning PIG controller. **(05)**

Q4.A) Explain the steps for plotting phase lag compensator using bode plot. **(05)**

B) Draw characteristics of lead, lag and lag-lead compensators. **(05)**

P.T.O.

Part B

Q5. A) Using Jury stability criterion, find if all the poles of the following transfer function lie inside the unit circle on the z-plane. **(05)**

$$G(z) = \frac{3z^4 + 2z^3 - z^2 + 4z + 5}{z^4 + 0.5z^3 - 0.2z^2 + z + 0.4}$$

B) Draw and explain the mapping between s-plane to z-plane for the following (i) Constant frequency loci (ii) Constant damping ratio loci. **(05)**

Q6(A) Determine the z-transform of (i) $\frac{a^2}{s(s+a)^2}$ **(05)**

(ii) $\frac{\omega}{s^2-\omega^2}$

B) Explain Mathematical modeling of the sampling process. Also plot the amplitude spectrum of the sampler output without aliasing. **(05)**

Q7. A) Discuss working of a stepping motor and its control action. **(05)**

B) Explain digital temperature control system with suitable diagrams. **(05)**

x-x-x