(2) BE-sem-VII – Old – Electrical-CS-II 31/5/16

QP Code : 29905

(3 Hours) **[Total Marks : 100**

N.B 1) Question No.1 is compulsory.
2) Attempt any " Four " out of remaining "Six".
3) Assume suitable data wherever necessary.

Q1) Attempt any **Four** questions.

A) Explain the different programming units of PLC. [05]
B) Explain in brief different forms of PID controller. [05]
C) Why correction factor is added to the required phase margin for the design of compensator. [05]
D) Explain the advantages of state space analysis over classical control system analysis. [05]
E) Derive the Z-transform for $f(t) = \sin wt.u(t)$. [05]

Q2)

A) For a unity feedback system with a forward transfer function $G(s) = \frac{K(S+7)}{S(S+5)(S+15)}$, Find the value of gain "K" to operate the system with 15% overshoot. [10]
B) Explain the design procedure of Lag Compensator. [10]

Q3)

A) Given the following open loop plant,

$$G(s) = \frac{200}{S(S+5)(S+10)}$$

Design a controller to yield a 15% overshoot and settling time of 2 seconds. Use phase variables form for the state space feedback. [10]
B) Explain the different issues in implementing PID controller. [10]

Q4)

A) Design an observer for the plant $G(s) = \frac{1}{(S+1)(S+2)(S+5)}$ represented in cascade form. The closed loop performance is governed by the characteristic polynomial $S^3 + 120S^2 + 2500S + 50{,}000$. [10]
B) Develop flowchart for digital compensator defined by $G_C(z) = \frac{X(z)}{E(z)} = \frac{Z+2}{Z^2+2.5Z+5}$. [10]

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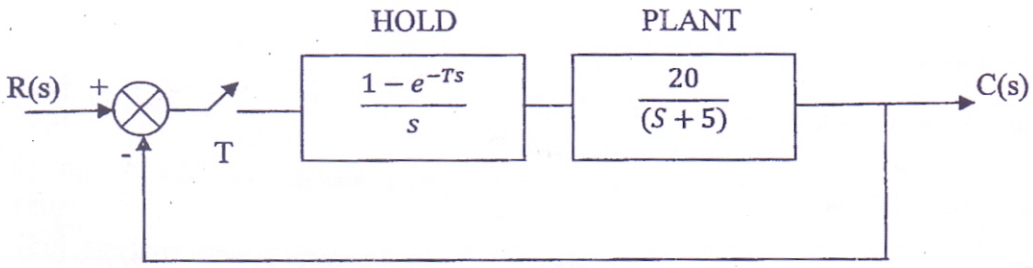
Q5)

A) Determine the range of sampling interval 'T' that will make following system stable. [10]



B) Draw & explain PLC ladder diagram for society water pumping system. [10]

Q6)

A) Explain the Timer & Counter instruction of PLC. [10]

B) Explain the data files of PLC. [10]

Q7) Write a short note on Any TWO. [10*2]

A) PLC Troubleshooting.

B) Integral windup & Anti windup circuit.

C) Concept of Controllability & Observability.

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