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(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 3066 Roll No.

B. Tech.

(SEM. VIII) EXAMINATION, 2006-07

COMPUTERISED PROCESS CONTROL

Time : 3 Hours] *[Total Marks : 100*

Note : *Attempt **all** questions.*

1 Attempt any **four** parts of the following : **5×4=20**

(a) Explain with block diagram the computer control system.

(b) Enlist various methods for data acquisition system. Explain any one in detail with neat sketch.

(c) What is supervisory control? Explain.

(d) Write the state equations and output equations in vector matrix form of the following :

$$\frac{d^2y(t)}{dt^2} + 4\frac{dy(t)}{dt} + y(t) = 5r(t)$$

(e) Write the state transition equations of the following state equations.

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$$\frac{d\,\bar{X}(t)}{dt} = \bar{A}\,\bar{x}(t) + \bar{B}\,\bar{u}\,(t)$$

(f) List the advantages and disadvantages of a open loop control system.

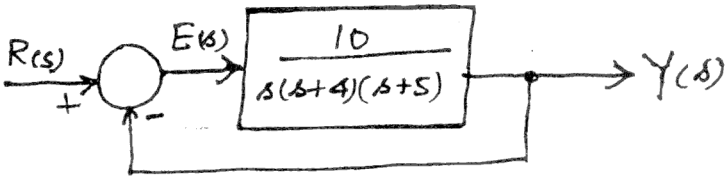
2 Attempt any **two** parts of the following : **10×2**

(a) Define observability and controllability of a system. Explain the relationship among controllability, observability and transfer function of following system.

$$\bar{A} = \begin{bmatrix} -1 & 0 & 0 & 0 \\ 0 & -2 & 0 & 0 \\ 0 & 0 & -3 & 0 \\ 0 & 0 & 0 & -4 \end{bmatrix}, \quad \bar{B} = \begin{bmatrix} 1 \\ 1 \\ 0 \\ 0 \end{bmatrix},$$

$$\bar{C} = \begin{bmatrix} 1 & 0 & 1 & 0 \end{bmatrix}, \quad \bar{D} = 0$$

(b) Find the closed loop transfer function and draw the state diagram for the following system shown. Also find the state transition equations of the system. The initial state vector is $\bar{X}(0)$ and $r(t) = \mu_s(t)$



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(c) Determine the value(s) of α so that system is uncontrollable or unobservable for the following transfer function.

$$\frac{Y(s)}{R(s)} = \frac{s+\alpha}{s^3+7s^2+14s+8}$$

3 Attempt any **two** parts of the following : **10×2**

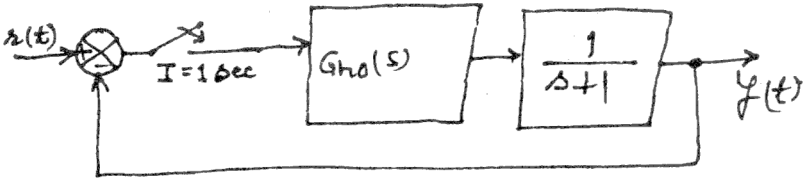
(a) (i) Find the z-transform of the following :

$$\frac{a^2}{s^2(s+a)^2}$$

(ii) Find the inverse z-transform of the following :

$$\frac{3z^2+2z+1}{z^2-3z+2}$$

(b) For the sampled – data system shown below, find the response to unit-step input.



(c) Write a note on PLD control algorithms.

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4 Attempt any **two** of the following : **10×2=20**

(a) Define adaptive control. Enlist the types of adaptivity and explain each. Give one typical example of adaptive control system with a neat sketch.

(b) Write a note on self tuning controllers.

(c) What is PLC? Explain in detail and also enlist that PLC offers advantages in comparison to electromechanical relays.

5 Write notes on any **two** of the following : **10×2=20**

(a) Centralised and distributed control system

(b) Advanced features of PLCs

(c) Installation and commissioning of PLC systems.