

[This question paper contains 4 printed pages.]

3108

Your Roll No.

MEE

J

Paper – EE.603

MODELLING, IDENTIFICATION AND CONTROL

Time : 3 Hours

Maximum Marks : 100

*(Write your Roll No. on the top immediately
on receipt of this question paper.)*

Attempt any Five questions.

All questions carry equal marks.

Assume suitable data, if any.

1. (a) Describe the differences between position and velocity forms of PI and PID control algorithms. Do we have these two forms for a proportional controller? (7)
- (b) What do you mean when it is said that a control algorithm is physically unrealizable? What are the necessary conditions for designing physically realizable dead beat and Dahlin algorithm. (7)
- (c) Design the deadbeat algorithm for a first order process with dead time equal to $3T$. (6)
2. (a) State and derive the expression for Ackermann's formula. (10)

P.T.O.

(b) Consider the system $x(K+1) = Gx(K) + Hu(K)$

$$\text{where } G = \begin{bmatrix} 0 & 1 \\ -0.16 & -1 \end{bmatrix}, \quad H = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

Determine a suitable state feed gain matrix 'K' such that the system will have the closed loop poles at: $Z_1 = 0.5 + j0.5$, $Z_2 = 0.5 - j0.5$.

(10)

3. (a) Consider two relations, R on A·B and S on BXC state their composition relation ROS : viz relation on AXC. (7)

(b) Find out the intersection between two fuzzy relational matrix

$$\mu_R = \begin{bmatrix} 0.1 & 0.6 & 0.3 \\ 0.0 & 0.1 & 1.0 \\ 0.1 & 0.7 & 0.8 \end{bmatrix} \text{ and}$$

$$\mu_S = \begin{bmatrix} 0.7 & 0.8 & 1.0 \\ 0.2 & 0.0 & 0.0 \\ 0.3 & 0.0 & 0.1 \end{bmatrix} \quad (6)$$

(c) State the criteria for selection of Fuzzy membership functions. Draw fuzzy membership functions for the following

$$y(x) = \begin{cases} 1 & 0 \leq x \leq 20 \\ \frac{35-x}{15} & 20 < x < 35 \\ 0 & \text{otherwise} \end{cases} \quad (7)$$

4. (a) Design a controller for an inverse response system

$$G(s) = \frac{(1 - 3s)}{(2s + 1)(5s + 1)}$$

using the direct synthesis approach. The desired closed loop behaviour shall have 1st order system response with $\tau_r = 1$. (7)

- (b) State and derive the expression for controller design by direct synthesis method. (5)

- (c) Obtain the exact direct synthesis controller for

the system : $G(s) = \frac{0.5 e^{-2.0}}{6s + 1}$. (8)

5. (a) State the objectives for model reduction. Explain the following methods for model reduction :

(i) Truncation method, (ii) Singular perturbation method and (iii) Balanced reduction. (12)

- (b) Derive the expression for internal model controller design. (8)

6. (a) Identify the system model in Z-transfer function for a single input, single output second order system with measurands are as follows :

$$\begin{array}{ll} y(0) = 2 & u(0) = 1 \\ y(1) = 1 & u(1) = 2 \\ y(2) = 5 & u(2) = -1 \\ y(3) = -2 & u(3) = 0 \\ y(4) = 0 & u(4) = -2 \\ y(5) = -6 & u(5) = 3 \\ y(6) = 7 & u(6) = 4 \end{array} \quad (10)$$

(b) Derive the expression for estimator in which each new measurement is used to update the previous least square estimate. Draw its block diagram.

(10)

7. Write notes on any **two** of the following :

- (i) Model reference method for adaptive controller
- (ii) Self tuning controller
- (iii) Ratio controller for flow

(2×10)

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3110

Your Roll No.

MEE

J

Paper – EE.611

(Programming Languages and Operating System)

Time : 3 hours

Maximum Marks : 100

*(Write your Roll No. on the top immediately
on receipt of this question paper.)*

Attempt any five questions.

All questions carry equal marks.

1. (a) Discuss the concept of array of pointers in C with the help of a suitable example.
(b) Explain the parameter passing by value and by address as applicable in C with the help of suitable examples. (10×2=20)
2. (a) How are stream classes handled in C++ ? Discuss your answer explaining hybrid inheritance.
(b) Write C syntax of file handling operations using `fopen()`, `fclose()`, `fgetc()`, `fputc()` and `fseek()`. Discuss their functioning also. (10×2=20)
3. What is polymorphism in C++ ? Discuss the usage of "pointer to an object" to implement run-time polymorphism. Give suitable program skeleton in support of your answer. (20)

P.T.O.

4. (a) Explain process-state transition diagram.
- (b) Explain the terms Swapper, job scheduling, long term scheduler, dispatcher and threading. (10×2=20)
5. (a) What are cooperating processes? Explain starvation and deadlock in brief. How deadlock is connected with the critical section of a process? Explain in brief.
- (b) What is a binary semaphore? Write a C function for binary semaphore and explain how it helps in Inter process communication? (10×2=20)
6. (a) Explain the algorithm and block diagram of segmentation with paging.
- (b) What is locality of reference? Differentiate between temporal and spatial locality. Discuss the Least Recently Used (LRU) page replacement policy. (10×2=20)
7. Write short notes on any two :
- (i) Services provided by UNIX Kernel
 - (ii) Unix architecture
 - (iii) Friend functions and friend classes
 - (iv) Exception Handling in C++ (10×2=20)