Final Exam

Operating System

Computer and Syst. Dept.
Time Allowed: 3 Hrs.
3rd Year Students.
Total Marks: 90
2011 – 2012

Solve the following Questions:

Question 1: Explain why? (Use the minimum words)

   (a)   It is recommended to use as few threads as possible in your applications.
   (b)   Some programmers prefer to build their applications in multi-threading manner.
   (c)   It is important to include inter-Track and inter-Sector gaps on the disk surface.
   (d)   Memory is a preemptive resource, while CD driver is not.

Question 2: Define Memory hierarchy, then;
   (a) Explain the different memory classifications?
   (b) Explain the different memory operations.
   (c) Discuss what is meant by instruction cycle.

Question 3: Explain what is meant by process states, then:
   (a) Draw the process state diagram.
   (b) What is the difference between process and program?
   (c) What is meant by process control block?
   (d) What is meant by context switch?

Question 4: Discuss what is meant by the following parameters:
   CPU utilization, System throughput, Turnaround time, Waiting time, Response time.
Then, Consider the following set of processes, with the length of the CPU burst time given in milliseconds:

Process	Burst Time	Arrival time
P_1	7	0
P_2	4	2
P_3	1	4
P_4	4	5

Using SRTF, then SJF, then RR (with Q=2) algorithms;
   (a)   Draw the Gant chart illustrates the execution of these processes.
   (b)   What is the Waiting Time (WT) for each process, and then calculate the Average Waiting Time (AWT) for all processes.
   (c)   What is the Turnaround time for each process?

Question 5: Use figures only to:

   (a)   Explain the linked disk allocation method.
   (b)   Ready queue and input queue.
   (c)   Explain how compilers and interpreter work?
   (d)   How to store a file using FAT in blocks 111,213,563,155 respectively.
   (e)   Computer internal structure.

Question 6: compare between: (briefly باختصار)
   (a)   RAM, ROM, Cache Memory.
   (b)   Magnetic disk and magnetic tapes.

مع تمنياتي

4- A control system as :

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -1 & -2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 1 \\ -1 \end{bmatrix} [u]$$

$$y = \begin{bmatrix} 1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

It is desired to check the state controllability and the output controllable as well .

5- A linear system as follows :

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -1 & -1 \end{bmatrix} \cdot \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

Applying the Liapunove function to check the stability .

6- A linear control system is described by the state equation ,

$$\dot{x} = Ax \quad , \quad A = \begin{bmatrix} -4k & 4k \\ 2k & -6k \end{bmatrix}$$

Find the restrictions on the parameter K to guarantee stability of the system.
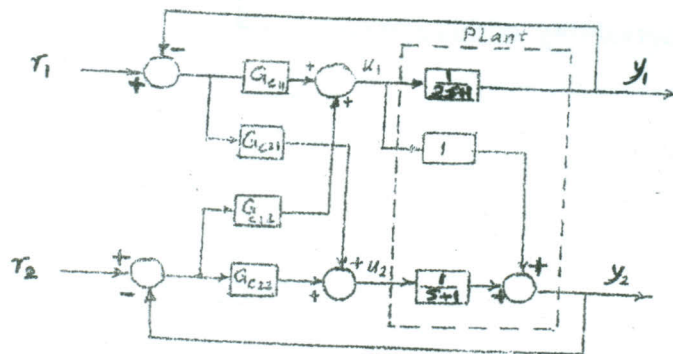
All the best
M. N. SERAG

Fig. 1. Multiple-input multiple-output system

Answer the following questions

1- a) For MIMO control system , drive the transfer matrix M (s) between input U (t) and out put Y (s)

b) A feedback control system has a forward and a feedback matrix as :

$$G(s) = \begin{bmatrix} \dfrac{1}{s+1} & -\dfrac{1}{s} \\ 2 & \dfrac{1}{s+2} \end{bmatrix} \quad \text{and} \quad H(s) = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

Determine the overall transfer matrix .

2 – Design a suitable series controllers for a multiloop control system as shown in Fig.1 , such that the closed loop transfer matrix is :

$$G(s) = \begin{bmatrix} \dfrac{1}{s+1} & 0 \\ 0 & \dfrac{1}{5s+1} \end{bmatrix}$$

3- A control system has the following dynamic matrices as :

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix} \cdot \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} \cdot [u],$$

$$y = \begin{bmatrix} 4 & 5 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

check the complete observability of this system.

P . T . O

4- A control system as :

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -1 & -2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 1 \\ -1 \end{bmatrix} [u]$$

$$y = \begin{bmatrix} 1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

It is desired to check the state controllability and the output controllable as well .

5- A linear system as follows :

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -1 & -1 \end{bmatrix} \cdot \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

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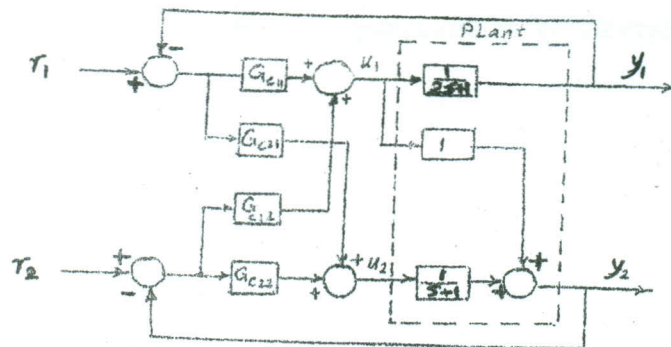
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Fig. 1. Multiple-input multiple-output system

Question 7:

i.   Define (in few words) the following Terms:

Disk access time, Disk bandwidth

Then use the C-Look, then scan, then SSTF scheduling techniques to calculate the total head movement for the following:

- Queue: 11, 98, 183, 37, 22, 122, 14, 8, 124, 65, 67, 78
- Head starts at: 50 and was previously at 60

ii.   A Hard disk has 5268 tracks on each surface. It has six plates. There are 512 sectors per track, and each sector stores 256 bytes.
- What is the capacity (size) of the disk?
- What is the size of the data that can be read by the head at a time?
- What is the number of disk cylinders?
- What are the total number of tracks in the disk?
- What are the number of sectors in each cylinder?
- What are the number of tracks in each cylinder?

Question 8: discuss in details the different file access methods? Then explain the concepts of data reliability and protection.

--------------- End of Questions ---------------

With Best Wishes
Dr: Ahmed Saleh

PLZ, send your comments about the exam to:
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