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6262-A *Your Roll No*

M.Sc. Computer Science/II Sem. J

MCS – 205 – MODELING AND SIMULATION

(OC)

Time 2 hours *Maximum Marks 40*

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

Attempt **all** *questions*
Use of Scientific Calculator and Statistical Tables are allowed. Parts of a question should be answered together.

1 Explain the terms

(a) Quantile – quantile Plot

(b) Transfer Functions

(c) State space models (6)

2 (a) Set up a Monte-Carlo technique for area under a curve f(x) in the interval [a, b]. (2)

(b) Obtain the Z-transform of $r(k) = k^2$ (2)

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3. (a) Examine the stability of a system with the following characteristic equation using Routh – Hurwitz Criterion

$$4s^2 - 2s + k = 0$$

where k is a parameter. (4)

(b) Consider the system described by

$$\dot{x} = \begin{pmatrix} 3 & -2/3 \\ 4 & -1/3 \end{pmatrix} x + \begin{pmatrix} 1 \\ 3 \end{pmatrix} u$$

Discuss the controllability of the system. (3)

(c) Find the conditions for the complete observability of the system described by

$$x' = \begin{pmatrix} a_1 & a_2 \\ a_3 & a_4 \end{pmatrix} x + \begin{pmatrix} 1 \\ 1 \end{pmatrix} u$$

$$y = [1 \quad 0]x$$ (3)

4 (a) What are the disadvantages of using acceptance-rejection technique for generating random variates ? What can be done to reduce the impact of such disadvantages ? (2)

(b) Compare AR(1) and EAR(1) time series input models (4)

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5 *Read carefully the following narrative and answer the questions that follow You can make any reasonable assumptions that may add value to your answers, without distorting the narrative itself All such assumptions should be clearly stated at appropriate place(s)*

Memory is required by the processes according to their needs Memory Manager module allocates the memory as demanded provided it is available Also it frees the memory freed by the processes when they terminate or when they explicitly free their storage areas (garbage collection) Sometimes, processes terminate abnormally and the fate of the memory allocated to them is uncertain It would have been easy to free such memory, if there were no other processes that were sharing this data There are some memory locations that are shared by as many as all the running processes Processes also include operating system's own processes such as memory manager module itself, device drivers, shells, and so on

Besides dealing with the requests for memory, memory manager also has to see if there is adequate memory available, free the memory no longer occupied by live processes, and do compaction and defragmentation of memory.

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Memory manager has priorities for its activities, such as decreasing priorities for garbage collection, compaction, defragmentation in this order Sometimes, memory is short and to reclaim, memory manager runs garbage collection routines, which in turn need memory, but inadequate memory is available. The only way is to wait and see if some process will terminate freeing explicitly some memory so that garbage collection could start. This may result even in a deadlock.

(a) Identify the events in this system (2)

(b) What should be the inputs for a simulation model to be built for the system ? (3)

(c) Select a method (for example, a suitable probability distribution) for designing input to your model, considering each of the events Give precise reasons for your selection. (2)

(d) Propose a simulation model for the system Draw a schematic flow chart for your model, at the macroscopic level (4)

(e) Design an experiment to model the situation when 80% of the running processes are demanding more memory (3)

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