Code No: D5503 **R09**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M.Tech II - Semester Examinations, March/April 2011

SYSTEM MODELING & SIMULATION

(EMBEDDED SYSTEMS)

Time: 3hours **Max. Marks: 60**

Answer any five questions

All questions carry equal marks

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1. a) Explain various components and organization of discrete event simulation model.
   b) What are the simulation diagrams? Explain them with neat sketches. [6+6]

2. a) State the statistical properties of U[0,1] generators.
   b) Write an algorithm that generates a time series x(k) with spectral density: $S_{xx}(\omega) = \frac{9}{\omega^2 + 4}$. [6+6]

3. a) Explain the Nomenclature used in modeling time-driven systems with neat sketches.
   b) List out the various types of delays that would come. Explain them. [6+6]

4. a) Derive the expressions for mean and variance of exponential distribution.
   b) The service times for six bank customers are 30,50,120,20,80 and 30 seconds. Assuming that these times are representative of an underlying exponential distribution:
      i) Determine the parameter λ.
      ii) What is the probability that a customer will take more than 90 seconds.
      iii) If 500 customers are serviced in one day, how many can be expected to take more than 90 seconds. [12]

5. a) Draw a simulation diagram and state transition diagram for M/M/1/n queue.
   b) An entrepreneur builds a car wash with one service bay and a driveway with room for two customers to wait. It is observed that cars arrive as a Poisson process with a mean rate of 4 cars per hour. Also it takes an average time of 10 minutes to wash a car. Determine:
      i) System behavior.
      ii) Mean number of customer in the system.
      iii) Mean waiting time in the system. [12]

6. a) State the convexity theorem. Explain its importance in search methodologies for system optimization.
   b) Min f = x^2-10$e^{0.1x}$ in the interval (-10, 5) to the accuracy of 10%. Use Golden section search method. [6+6]

7. a) State the desirable features of simulation software.
   b) Explain salient features of ARENA software. [6+6]

8. a) Explain various guidelines for determining levels of model detail.
   b) Distinguish between the terms validation, verification and credibility. [6+6]

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