

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

PAPER ID : 199401

Roll No.

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**B.Tech.**

(SEM. IV) THEORY EXAMINATION 2013-14

**BASICS OF SYSTEM MODELLING AND SIMULATION**

Time : 3 Hours

Total Marks : 100

Note :- The question paper contains three Sections, Section B and Section C. Follow the instruction as given in each Section.

**SECTION—A**

1. Attempt all parts :

(2×10=20)

- (a) Classify the different types of models.
- (b) Write the component of system with example.
- (c) What is the system modeling ?
- (d) Compare Analytical and Simulation Model.
- (e) What are the properties of C.D.F. ?
- (f) What do you mean by parameter estimator ?
- (g) Define Service Utilization ?
- (h) Define Kendall notation for queuing theory.
- (i) What do you mean by reliability estimation ?
- (j) What is the real world application of simulation ?

### SECTION—B

2. Attempt any **three** parts of following : (3×10=30)

(a) Define the entities, attributes and activities of any five of the following :

- (i) A cafeteria
- (ii) A grocery store
- (iii) A hospital emergency room
- (iv) A fast food restaurant
- (v) A laundromat
- (vi) A university library.

(b) Write down the principles and steps in creating system modeling with required flow table.

(c) The CDF for a certain random variable is given as :

$$F_x(x) = \begin{cases} 0, & -\infty < x \leq 0 \\ kx^2, & 0 < x \leq 10 \\ 100k, & 10 < x < \infty \end{cases}$$

- (i) Find the value of k;
  - (ii) Find the value of  $P(X \leq 5)$
  - (iii) Find the value of  $P(5 < X \leq 7)$
  - (iv) Find the expression for PDF.
- (d) In car-wash service facility, cars arrive for service according to a poisson distribution with mean of 30 per hour. The time for washing and cleaning follows an exponential distribution with a mean of 1.2 min/car. There is only one washing station in the facility. Assume that there

is no storage of parking spaces for arriving cars then find out  $L_s, L_q, W_s, W_q$  and find out the probability when six customers in the system.

(e) Explain any **three** parts the following :

- (i) Transfer line model
- (ii) Inventory system model
- (iii) Interpretation of confidence interval of a parameter
- (iv) Deadlock detection model.

### SECTION—C

**Note :-** Attempt **all** questions with their instructions : (5×10=50)

3. Attempt any **two** parts of the following :

- (a) What is the Simulation ? What are the needs, advantages and disadvantages of simulation modeling ?
- (b) Discuss the merits and demerits of simulation.
- (c) What is the criterion of selecting appropriate modeling techniques ?

4. Attempt any **two** parts of following :

- (a) What is the model ? What is the type of system model and what are the differences between static and dynamic model ?
- (b) Write a short note on the following :
  - (i) Validation
  - (ii) Calibration
  - (iii) Verification.
- (c) What is the Monte Carlo method ? Explain with any one example.

5. Attempt any **two** parts of following :
- What are GOOD-OF-FIT tests ? Explain any one method with the example.
  - What is the Distributed Lag Model and COBWEB Model ? Explain with example.
  - Find out The Maximum likelihood function for the Exponential Distribution,  $\theta = \beta$ ,  $\beta > 0$ ,  $f_p(x) = \frac{1}{\beta} e^{-\frac{x}{\beta}}$  for  $x \geq 0$ .
6. Attempt any **two** parts of following questions :
- Find steady state probability ( $P_n$ ) in queuing model M/M/1/GD/ $\infty/\infty$  and obtain expression for  $P_n$ ,  $L_s$ ,  $L_q$ ,  $W_s$ ,  $W_q$ .
  - Discuss the Poisson distribution. Derive an expression of it.
  - Explain the Multi Server M/M/c/GD/ $\infty/\infty$  model.
7. Explain any **three** parts the following :
- Computer network model
  - Capital recovery model
  - Job shop model
  - Pi value estimation
  - What is just-in-time model ?