

(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 :
- (a) What are GOOD-OF-FIT tests ? Explain any one method with the example.
 - (b) What is the Distributed Lag Model and COBWEB Model ? Explain with example.
 - (c) 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 :
- (a) Find steady state probability (P_n) in queuing model M/M/1/GD/ ∞/∞ and obtain expression for P_0, L_s, L_q, W_s, W_q .
 - (b) Discuss the Poisson distribution. Derive an expression of it.
 - (c) Explain the Multi Server M/M/c/GD/ ∞/∞ model.
7. Explain any **three** parts the following :
- (a) Computer network model
 - (b) Capital recovery model
 - (c) Job shop model
 - (d) Pi value estimation
 - (e) What is just-in-time model ?