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14MAR41

Fourth Semester M.Tech. Degree Examination, June/July 2017
Modeling, Simulation and Analysis of Manufacturing Systems

Time: 3 hrs.

Max. Marks: 100

Note: 1. Answer any FIVE full questions.
2. Use of distribution table is permitted.

- 1 a. Define simulation. What are the advantages and limitations of simulation? (10 Marks)
 b. Briefly explain Monte-Carlo simulation and its area of applications. (10 Marks)

- 2 a. With the help of a block diagram, explain the various steps involved in a simulation study. (11 Marks)
 b. Differentiate between :
 i) Discrete and continuous systems
 ii) Deterministic and stochastic simulation
 iii) Endogenous and exogenous event. (09 Marks)

- 3 a. What is modeling? Briefly explain the various types of models. (08 Marks)
 b. Explain the following :
 i) Cumulative distribution function [CDF]
 ii) Probability density function [PDF]
 iii) Poisson distribution
 iv) Exponential distribution. (12 Marks)

- 4 a. What are the techniques for increasing model validity and credibility? (08 Marks)
 b. Explain in detail simulation of a single server queuing system with example. (12 Marks)

- 5 a. What are random numbers? Briefly explain the properties of random numbers. (06 Marks)
 b. Explain linear congruential method of generating random numbers. (06 Marks)
 c. Generate a sequence of random numbers using multiplicative congruential method, given $X_0 = 63$, $a = 19$, $c = 0$ and $m = 100$. Find three 2-digit random numbers. (08 Marks)

- 6 a. Explain inverse-transform method for continuous random variables and discrete random variables. (08 Marks)
 b. Explain the types of simulation with regard to output analysis of a single system. (06 Marks)
 c. Briefly explain the following variance reduction technique :
 Common random numbers [CRN] and antithetic variates [AV]. (06 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

- 7 a. Use inventory systems simulation to calculate total profit and loss profit from excess demand for a newspaper seller who classifies his news days into 3 types i.e “Good”, “Fair” and “poor” and their probabilities are 0.35, 0.45 and 0.20 respectively. The news stand buys the paper at 33 cents each and sells them for 50 cents each. News papers can be purchased in bundles of 10. The distribution of news papers demand is given in the following table :

Demand	Demand probability distribution		
	Good	Fair	Poor
40	0.03	0.10	0.44
50	0.05	0.18	0.22
60	0.15	0.40	0.16
70	0.20	0.20	0.12
80	0.35	0.08	0.06
90	0.15	0.04	0.00
100	0.07	0.00	0.00

Salvage value of the scrap is 5 cents each simulate for purchase of 70 news papers for 20 days. News papers not sold at the end of the day are sold as scrap for 5 cents. The random digit assignment [RDA] for type of news days and RDA for demand is given in the table below :

(15 Marks)

Table: Simulation table for purchase of 70 newspapers for 20 days.

Days	RDA for news days	RAD for demand
1	94	80
2	77	20
3	49	15
4	45	88
5	43	98
6	32	65
7	49	86
8	00	73
9	16	24
10	24	60
11	31	60
12	14	29
13	41	18
14	61	90
15	85	93
16	08	73
17	15	21
18	97	45
19	52	76
20	78	96

- b. Briefly explain the concept of discrete event simulation. (05 Marks)
- 8 a. What are the potential benefits of using simulation in manufacturing system? (10 Marks)
- b. Explain the simulation case study of a metal parts manufacturing facility. (10 Marks)
