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Reg. No. : ……………………

Name :……………………

Sixth Semester B.Tech. Degree Examination

(2013 Scheme)

13.605: SYSTEM SIMULATION (N)

Time: 3 Hours **Max. Marks: 100**

Instructions: 1) Answer ***all*** questions in ***Part-A*** and ***any one full*** question from **each** module in Part-B.

2) Any missing data shall be assumed and all assumptions shall be clearly stated.

3) Use of ***statistical tables*** allowed.

PART - A

1. Enlist the components of a system.

2. Define the term 'system engineering'.

3. What are cobweb models?

4. For an exponential distributed random variable **X**, find the value of **λ** that satisfies the following relationship: $P(X \leq 3) = 0.9P(X \leq 4)$

5. Random numbers generated by a random number generator called 'pseudo-random numbers'. Comment on the statement.

6. What are the statistical properties that must be possessed by random numbers?

7. Why the inverse transform technique cannot be applied easily for generating normally distributed random variates?

8. What do you mean by 'terminating simulation'?

9. What do you mean by 'face validity'?

10. Enlist any two softwares used for discrete event simulation.

(2 x 10 = 20 marks)

PART B

MODULE – I

11. Develop a Cobweb model for the following market.

Demand 'D' = 10 – 0.9P

Supply 'S' = -2.4 + 1.2P_{-1}

The market is cleared. Comment on the market. ***(20 marks)***

OR

12. Explain the Monte Carlo approach. Use the approach to evaluate the following:

(i) The area of a circle.

(ii) Value of π. ***(20 marks)***

MODULE – II

13. Determine whether there is an excessive number of runs above or below the mean for the following sequence of numbers. Use $\alpha = 0.05$.

0.39	0.66	0.97	0.87	0.65	0.56	0.45	0.23	0.36	0.76
0.19	0.76	0.87	0.05	0.54	0.45	0.23	0.56	0.46	0.38
0.18	0.02	0.96	0.67	0.16	0.45	0.21	0.35	0.86	0.54
0.35	0.47	0.68	0.09	0.30	0.76	0.16	0.59	0.69	0.37

(20 marks)

OR

14. Consider combining three multiplicative generators with m_1 = 32363, a_1 = 157, m_2 = 31727, a_2 = 146, m_3 = 31657, and a_3 = 142. Generate 5 random numbers with the combined generator using initial seeds $X_{i,0}$ = 100, 300, 500 for the individual generators i = 1, 2, 3.

(20 marks)

MODULE – III

15.(a) Explain the direct transformation technique for Normal and Lognormal distributions. Using the technique, obtain normal variates with mean μ = 10 and variance σ^2 = 4. ***(10 marks)***

(b) Use inverse transform technique to sample from the following distributions: (i) Exponential and (ii) Triangular {with range (1, 10) and mode at x = 4}.

(10 marks)

OR

16. Explain Next-event and Fixed-increment time advance mechanisms in simulation. ***(20 marks)***

MODULE – IV

17. The number of vehicles arriving at a junction in a 5-minute period between 8:00 A.M. and 8:05 A.M. was monitored for five workdays over a 20-week period. The data collected is given below:

Arrivals / Period	0	1	2	3	4	5	6	7	8	9	10	11
Frequency	12	10	19	17	10	8	7	5	5	3	3	1

The histogram of the data appeared to follow a poisson distribution. Apply suitable test to test the hypothesis that the underlying distribution is poisson. Use $\alpha = 0.05$.

(20 marks)

OR

18. Explain in detail the process of verification and validation of simulation models. ***(20 marks)***

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