`Register No.: …… Name: ……..

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

SECOND SEMESTER M.TECH DEGREE EXAMINATION (Regular), JULY 2022

ROBOTICS AND AUTOMATION

(2021 Scheme)

Course Code: **21RA204-B**

Course Name: **System Analysis and Design**

Max. Marks: **60** **Duration: 3 Hours**

Use of statistical table is permitted.

PART A

(Answer all questions. Each question carries 3 marks)

1. Explain the role of simulation in robotics.
2. Differentiate between a general random number and a pseudo-random number.
3. Distinguish the uniform and weibull distributions.
4. Discuss the role of validation in simulation.
5. Compare the modes of behaviour in dynamic systems.
6. List the tools for system thinking.
7. Discuss the term "data smoothing" in statistics.
8. Distinguish the simulation languages and packages.

PART B

(Answer one full question from each module, each question carries 6 marks)

MODULE I

9. With the help of a flowchart, Illustrate the steps involved in a simulation study. (6)

OR

10. a) Differentiate between simulation approaches and numerical approaches. (3)
    b) Examine the role of Monte Carlo simulation in system analysis. (3)

MODULE II

11. A sequence of thousand 3-digit numbers is generated using a random number generator, and analysis indicates the following observations; (6)
    (a) 512 numbers have all the three digits different
    (b) 380 numbers contain precisely one pair of like digits
    (c) 108 numbers contain three like digits.

    Based on the poker test, evaluate the independence of the numbers with $\alpha=0.05$.

OR

12. a) Illustrate the working of the pseudo-random number generator with a block diagram. (4)
    b) List the methods for checking the quality of random numbers. (2)

MODULE III

13. a) Discuss the concept of the inverse transform method for the generation of random variates. (3)
    b) Differentiate between direct transform and inverse transform methods. (3)

OR

14. Represent an algorithm for generating a random variable from the probability density function, $f(x)= 6x(1-x)$; $0<x<1$ and discuss its efficiency using the acceptance-rejection technique. Use samples from the distribution with density $h(x)=2(1-x)$ for reference. (6)

MODULE IV

15. Classify the methods of discrete simulation with the help of examples. (6)

OR

16. a) Examine the next-event approach for discrete event simulation. (3)
    b) Differentiate between next-event approach and fixed time increment methods. (3)

MODULE V

17. Describe the fundamental modes of dynamic system behaviour. (6)

OR

18. a) Illustrate the concept of S-shaped growth. (4)
    b) Explain the effect of overshoots in S-shaped growth (2)

MODULE VI

19. a) Examine the role of problem identification in dynamic modelling. (3)
    b) Analyze the principles of simulation modelling. (3)

OR

20. a) Differentiate between first-order positive and negative feedback systems. (4)
    b) Explain the role of table functions in system dynamic modelling. (2)

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