UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2021

Course: CSEG 7005 modeling and simulation of digital systems   **Semester: II**
Program: M.Tech CSE
Time: 03 hrs.   **Max. Marks: 100**

Instructions: Attempt all Questions.

SECTION A

S. No.		Marks	CO
1	What are various determining factors of complexity of any system?	5	CO1
2	What do you mean by following system theories? a) Systems approach and, b) system dynamics approach.	5	CO1
3	State the steps of mid-square method for random number generation. For a seed 9456 generate two $U(0,1)$ random numbers. What are the major drawbacks of Mid Square method?	5	CO3

4	For a given Multiplicative Congruential Generator, Identify whether it will have full period or not.
	      a) $Z0=28$, $a=35$, $m=17$
	      b) $Z0=33$, $a=21$, $m=17$
		5	CO3

5	Differentiate between discrete systems Vs Continuous systems	5	CO4
6	State the formula for Combined Linear Congruential Method for generating Random Numbers. What will be its full period?	5	CO3

SECTION B

7	Perform Kolmogorov –Smirnov test to test the following random numbers in (0,9) for uniformity (find out only D). 3,5,7,8,1,3,5,2,7,1,9,2,4,3,2,8,4,6,7?	10	CO3
8	Perform chi-square test to test the following random numbers in (0,9) for uniformity (find out only X_0). 3,5,7,8,1,3,5,2,7,1,9,2,4,3,2,8,4,6,7, 3,5,7,8,1,3,5,2,7,1,9,2,4,3,2,8,4,6,7, 3,5,7,8,1,3,5,2,7,1,9,2,4,3,2,8,4,6,7	10	CO3
9	Draw a causal loop (system Dynamics) for an inventory management system. Explain it.	10	CO2

10	State and explain by examples, various types of models. How is simulation models classified? Give examples.	**10**	**CO1**
11	A given climate system has two random variables, X (days) and Y(temperature). The scientific readings recorded earlier gave following sets for the above variables.	**10**	**CO5**

X	50	59	57	65	68	55	56	59	61
Y	11	15	11.5	14	19	20	21	18	12

A model developed is represented as $Z(comfort)=X*Y/30$. Use empirical continuous distribution to perform inverse transform and generate 2 variates for X and Y. Take $U(0,1)$ random numbers as 0.356, 0.548.

OR

What are the desired properties of a good random number generator? Explain each.

SECTION-C

Long answer Questions. Detailed discussion is required.

| 12 | Explain the process of modelling via 'structuring' and supplying data. Make mathematical model of 'quality learning' in a class room system. Use all the steps of modelling with proper description arriving to a mathematical model. Explain how this model will be used in simulation.

OR

Explain in detail the following:

    a. Model verification and validation.
    b. Discrete event simulation.
    c. Future Event Lists.
    d. Queuing System as a Discrete event simulation. | **20** | **CO3,CO4** |