(2 ½ Hours)   [Total Marks:60]

N.B: (1) All questions are compulsory.

(2) Figures to the right indicate marks.

(3) Illustrations, in-depth answers and diagrams will be appreciated.

(4) Mixing of sub-questions is not allowed.

Q1.		**Attempt the following (any Two)**	**(12)**
	(A)	Why is simulation needed? Explain the example of interconnected system subject to variability	6
	(B)	Explain three phase simulation model with help of diagram.	6
	(C)	Explain the discrete-Event Simulation Approach for Telephone Call Centre Simulation?	6
	(D)	Write a short note on Computer generated random numbers.	6
Q2.		**Attempt the following (any Two)**	**(12)**
	(A)	Explain the options availability to represent variability in simulation?	6
	(B)	Explain in detail the three methods of white box validation and verification?	**6**
	(C)	Explain the paired t-approach in comparison of more than two scenarios.	6
	(D)	Explain welch's method. Discuss its limitation?	6
Q3.		**Attempt the following (any Two)**	**(12)**
	(A)	How agent based simulation modeling and object-oriented software design have a lot in common?	6
	(B)	Explain the three methods in simulation modeling with example?	6
	(C)	Explain synchronous and asynchronous communication between agents.	6
	(D)	Explain the types of standard and customs networks used in anylogic. Draw neat diagram of each.	6

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Q4.   **Attempt the following (any Two)**   **(12)**

    (A)   What are the different types of Triggers used in state charts explain   6
the function of each?

    (B)   What is state chart? Draw and explain the state chart of laptop   6
running on battery.

    (C)   Who are the agents? Who are the agents in an American   6
automotive market model?

    (D)   Explain agent communication with respect to message sequence   6
diagram?

Q5.   **Attempt the following (any Two)**   **(12)**

    (A)   What is simulation? Explain four main classes of system. What are   6 M
added in simulation?

    (B)   Explain black box validation comparison with alternative models?   6

    (C)   What do you mean by multi-method modelling? Explain briefly?   6

    (D)   Explain the terms model time, date and calendar?   6

************ALL THE BEST************

(2 ½ Hours)   **[Total Marks: 60**

N.B: (1)   **All questions are compulsory.**
        (2)   Figures to the **right** indicate full marks.
        (3)   **Assume additional data if necessary** but state the same clearly.
        (4)   Symbols have their usual meanings and tables have their usual standard design
             unless stated otherwise.
        (5)   Use of **calculators** and statistical tables are **allowed**.

Q.1 Attempt <u>any two</u> of the following   **(12)**
a) State the Euclidean Algorithm. Use the Euclidean algorithm to find gcd(1001, 1331)
b) State and explain the application of Congruences.
c) What is a Linear Congruence? Use the Chinese Remainder Theorem to solve the following system of congruences: $x \equiv 2 \pmod 3$, $x \equiv 3 \pmod 5$, $x \equiv 2 \pmod 7$
d) What is quadratic residue? Find the quadratic residue of 7

Q.2 Attempt <u>any two</u> of the following   **(12)**
a) Explain the broad working of DES.
b) Discuss the cryptanalysis of Substitution Cipher.
c) Find the encryption and decryption functions of Affine Cipher for the key K=(7,3). Hence encrypt the text CYBER with the help of the evaluated encryption function.
d) Write a short note on SHA.

Q.3 Attempt <u>any two</u> of the following   **(12)**
a) State the RSA Algorithm. Explain with an example.
b) Explain the Solovay–Strassen Algorithm.
c) What is Public Key Infrastructure? Explain PKIX Architectural Model.
d) Discuss the possible attacks on RSA?

Q.4 Attempt <u>any two</u> of the following   **(12)**
a) State and explain the Diffie Hellman Key Exchange Algorithm.
b) Write a note on Certificate Lifecycle.
c) What is MTI Key Agreement?
d) Discuss the Station-to-station protocol?

Q.5 Attempt <u>any two</u> of the following   **(12)**
a) State Fermat's Little Theorem. Use it to calculate $23^{1002} \bmod 41$
b) Explain the various Algorithm Modes.
c) Explain the following:
   i)   Legendre Symbol   ii) Jacobi Symbol
d) Write a short note on Pretty Good Privacy Services.

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(2½ Hours) **[Total Marks:60]**

N.B.: (1) **All** questions are **compulsory**.

(2) **Figures** to the **right indicate marks**.

(3) **Illustrations**, in-depth **answers** and **diagrams** will be **appreciated**.

(4) **Mixing** of **sub-questions** is **not allowed**.

Q1.   **Attempt the following (any Two)** **(12)**

(A) What is Clustering? State and explain any one example of Clustering in Non-Euclidean spaces.

(B) Explain K-means Algorithm. Apply the algorithm for the data {2, 3, 4, 10, 11, 12, 20, 25, 30} for k=2

(C) Describe Agglomerative algorithm. Apply Complete linkage clustering for the below data :

	A	B	C	D	E
A	0				
B	9	0			
C	3	7	0		
D	6	5	9	0	
E	11	10	2	8	0

(D) Explain in brief Stream-Computing Model. State and explain any Stream-Clustering Algorithm.

Q2.   **Attempt the following (any Two)** **(12)**

(A) Explain Rule based classifier. Compare them with tree-based classifier.

(B) Write a short note on information gain theory.

(C) What is confusion matrix? Explain the importance of confusion matrix in evaluation of algorithm. Explain how to determine size of confusion matrix with example?

(D) What is CART and CHAID? Explain how CHAID is better than CART?

Q3. **Attempt the following (any Two)** **(12)**

(A) Explain the term Eigenvalue and Eigenvector with Example.

(B) Write the steps to calculate Eigenvalues and the corresponding Eigenvectors? Apply steps to matrix $\begin{bmatrix} 1 & -2 \\ -5 & 4 \end{bmatrix}$.

(C) What is SVD? State the significance of SVD.

(D) Explain following:
1. Pseudoinverse
2. CUR

Q4. **Attempt the following (any Two)** **(12)**

(A) What is Spam? What innovation Google introduced for calculating page rank to combat with the spam?

(B) Explain how PageRank iterations can be implemented using MapReduce.

(C) State the steps to follow to integrate topic-sensitive PageRank into a search engine.

(D) What is dimensionality reduction? Explain with suitable example.

Q5. **Attempt the following (any Two)** **(12)**

(A) Describe the working and characteristics of GRGPF Algorithm.

(B) What is ROC Curve? What is the significance of ROC Curve? What does the shape of curve indicate?

(C) Calculate the eigenvalue and Eigenvector of matrix $\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$

(D) Briefly explain Architecture of a Spam Farm.

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(2 ½ Hours)   **[Total Marks:60]**

N.B: (1) All questions are compulsory.
    (2) Figures to the right indicate marks.
    (3) Illustrations, in-depth answers and diagrams will be appreciated.
    (4) Mixing of sub-questions is not allowed.

Q1.	**Attempt the following (any Two)**	**(12)**
(A)	What is Activation Function? Discuss frequently used Activation Function	
(B)	Explain in detail Feedforward Neural Network.	
(C)	Discuss the variations of Radial Basis Neural Network.	
(D)	Explain Reinforcement Learning Problem in detail.	
Q2.	**Attempt the following (any Two)**	**(12)**
(A)	What is Fitness Function? Also discuss different optimization Problem.	
(B)	Discuss different Crossover Operators used in Genetic Algorithm.	
(C)	Explain different types of Mutation Operator in Genetic Programming.	
(D)	Explain in detail operators used in Evolution Strategy.	
Q3.	**Attempt the following (any Two)**	**(12)**
(A)	What is Particle Swarm Optimization? Explain Global Best PSO in detail.	
(B)	Explain Foraging behaviour of Ants in detail.	
(C)	Explain how ACO Algorithm is applied to Quadratic Assignment Problem.	
(D)	Discuss Different Social Network Structure developed for PSO.	
Q4.	**Attempt the following (any Two)**	**(12)**
(A)	Explain Antibody and Antigens	
(B)	Explain the Life Cycle of Lymphocytes.	
(C)	Explain how Danger Theory Model is applied to Adaptive Mailbox	
(D)	Discuss the Characteristics of Fuzzy Set.	
Q5.	**Attempt the following (any Two)**	**(12)**
(A)	What is the aim of Mutation in GA? Discuss the Mutation Operator for Binary and Floating Point Representation.	
(B)	Discuss the application of Evolutionary Programming.	
(C)	Explain the Fuzzy Rule Based Reasoning System.	
(D)	Discuss Stochastic Training Rule in detail.	

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