[Total Marks: 60]

(2 ¹/₂ Hours)

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)

- (A) "Simulation is preferable to experimentation with real system or other modelling approaches. But there are problems using simulation that must not be ignored." Justify the above statement.
- (B) Aeroplanes are classified into two sizes: small and large. Small aeroplanes only require a 1.5 minute sot on the runway, while large aeroplanes require 2.5 minutes. It is expected that 70% of aeroplanes will be small. The time between aeroplanes arriving for landing is expected as follows:

Time between arrival for	Percentage
landing(minutes)	
2-3	30%
3-4	35%
4-5	25%
5-6	10%

The time between arrivals for take-off is expected to be same. Develop a three-phase discrete-event simulation of the problem.

- 1) Define B-events and C-events for the problem.
- 2) Create samples from the distributions for inter-arrival time and aeroplane size.
- 3) Simulate a period of operation at the airport.
- (C) Describe the features of conceptual modelling. What are the requirements for an effective conceptual model?
- (D) Why a modeller does need to simplify a model? Discuss the methods used by a modeller for model simplification.

Q2.

Attempt the following (any Two)

- (A) Which methods do we use to deal with initialization bias? Discuss any one of them.
- (B) How do you compare multiple replications and long runs used to estimate the model performance with sufficient accuracy?
- (C) Explain the approaches used to perform black-box validation. Compare black-box validation with white box validation.
- (D) Enlist the methods proposed to construct confidence interval for output data and explain batch means method to achieve it.

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Q3.

Attempt the following (any Two)

- (A) Explain how system dynamics method is different than discrete event modelling.
- (B) Discuss multi method model architectures.
- (C) Describe asynchronous and synchronous time models in agent based models.
- (D) Enlist the types of spaces anylogic supports. Explain any two of them in detail.

Q4.

Attempt the following (any Two)

(A) What is a statechart? How do state charts differ from action charts and flow charts?

- (B) Explain the possible ways to trigger a state chart transition and how do they work.
- (C) Discuss how animation frames and replicated shapes arehandled in anylogic software.
- (D) Describe database connectivity objects offered by anylogic with help of an example.

Q5.

Attempt the following (any Two)

(12)

- (A) Explain the process to fit a statistical distribution to empirical data.
- (B) Describe the problems that arise in trying to validate and verify a model.
- (C) What are the modes simulation models can use to execute in anylogic on a given scale? Explain them in detail.
- (D) What is simulation optimization? Discuss shortcomings in its use.

(2 ¹/₂ Hours)

[Total Marks: 60

N.B:	 All questions are compulsory. Figures to the right indicate full marks. 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) Ose of carculators and statistical tables are allowed.	
Q.1	Attempt any two of the following	(12)
a)	Describe using example usage scenarios available to cloud consumer.	6
b)	Define Service orchestration? Why it is required?	6
c)	What is role of cloud broker as per The NIST Reference	6
•	Architecture?	-
d)	Give an example in which three cloud service consumers share	6
	virtual servers hosted by the same physical server. What is the result of this setup?	
	result of this setup?	
Q.2	Attempt <u>any two</u> of the following	(12)
a)	What are primary concerns related to cloud storage? Describe the	6
	cloud storage device mechanism.	
b)	Explain three common agent-based implementation formats used in	6
	the cloud usage monitor mechanism. What is seeling down and seeling up related to virtual server? How	6
()	this can be achieved?	U
d)	Explain some monitoring variables used in pay-per-use monitor	6
	mechanism. How pay-per-use monitor is implemented?	-
Q.3	Attempt any two of the following	(12)
-		
a)	How cloud service can become unavailable? What is a solution for	6
	this problem?	
b)	What is a resource constraint? Explain resource reservation	6
	architecture.	ſ
c) d)	Explain the use of rapid provisioning architecture.	0
u)	migration? How it is useful in cloud computing?	U

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Q.4	Attempt any two of the following	(12)
a)	Explain the architecture and administration of SaaS cloud delivery model from the point of view of the cloud provider.	6
b)	Explain the architecture and administration of IaaS cloud delivery model from the point of view of the cloud consumer.	6
c)	How operating cost can be minimized and how IT resources can be optimized in an organization?	6
d)	How pricing models can be used in IaaS, PaaS and SaaS?	6
Q.5	Attempt any two of the following	(12)
a)	Explain basic terms and concepts relevant to cloud computing security. Explain any one way to implement Cloud security.	6
b)	What is use of multi-device broker mechanism? How multi-device brokers commonly exist?	6
c)	Describe various tasks that can be performed by cloud consumers via a remote administration console.	6
d)	Explain zero downtime architecture. Why it is required?	6

(2 ¹/₂ Hours)

- N.B: (1) <u>All questions are compulsory.</u>
 - (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

- a) What is quadratic residue? Find the quadratic residue of 7
- b) State the Euclidean Algorithm. Use the Euclidean algorithm to find gcd(1001, 1331)
- 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) State Fermat's Little Theorem. Use it to calculate $23^{1002} \mod 41$

Q.2 Attempt any two of the following

- a) 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.
- b) Write a short note on MAC.
- c) Discuss the cryptanalysis of Substitution Cipher.
- d) Explain the working of AES.

Q.3 Attempt any two of the following

- a) Explain the Miller-Rabin Algorithm.
- b) Discuss the various attacks on RSA.
- c) What is Public Key Infrastructure? Explain PKIX Architectural Model.
- d) Explain the working of ElGamal Cryptosystem.

Q.4 Attempt <u>any two</u> of the following

- a) Write a note on Strict Hierarchy Trust Model.
- b) Write a short note on Pretty Good Privacy Services.
- c) Discuss Mitchell-Piper Key distribution pattern.
- d) What is MTI Key Agreement?

Q.5 Attempt <u>any two</u> of the following

- a) State and explain the application of Congruences.
- b) Explain the various Algorithm Modes.
- c) State the RSA Algorithm.
- d) Write a note on Certificate Lifecycle.

[Total Marks: 60

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				(2 1/2	hours)	[Total marks: 6	50]
N	. B.:	(1) All ques	tions are	e compu	lsory			
		(2) Figures	to the ri ş	ght indic	ate ful	l marks	5.	
Q1.		Attempt the following (any Two) (1			(12)			
	(A)	Distinguish be	tween ag	glomera	tive an	d divisi	ve algorithm.	06
	(B)	Describe Complete Link Algorithm. Draw a Dendogram for following					06	
		adjacency mat	rix using	Comple	te Link	techni	ques	
		A	0	2	3	4		
		В	2	0	4	4		
		C	3	4	0	5	-	
		D	4	4	5	0		
				1 • .1	C 1	. 1	CDDCCAN	0.6
	(C)	What is DBSC	CAN? Ex	plain the	funda	mentals	of DBSCAN.	06
	(D)	State and explain in brief any one partitioning algorithm. What are its 06 advantages?				06		
Q2.		Attempt the f	ollowing	g (any Ty	wo)			(12)
	(A)	What is classification? What are the challenges in classification? State the ways to overcome these challenges. 06					06	
	(B)	Explain the information gain theory with suitable example. 0						06
	(C)	Explain how support vector machine are used for classification in Big Data 0 applications. Give suitable example.						06
	(D)	What is CART? Explain characteristics of CART.					06	
Q3.		Attempt the following (any Two) (12					(12)	
	(A)	Explain how Eigenvalue and Eigenvector are used in modern databases. 06					06	
		Find Eigenvector and Eigenvalue for the given matrix:						
					3	$\begin{bmatrix} 3 \\ -1 \end{bmatrix}$		
	(B)	Consider <i>M</i> be	e the mat	rix of da	ta poin	ts,		06
		$\begin{bmatrix} 1 & 1 \\ 2 & 4 \\ 3 & 9 \\ 4 & 16 \end{bmatrix}$						
		i. What are $M^T M$ and $M M^T$?						
	ii. Compute the Eigen pairs for $M^T M$							

(12)

(C)	Describe the dimensionality using Singular-Value decomposition.	06
(D)	Write a short note on Collaborative Filtering and its use in big data.	06

Q4. Attempt the following (any Two)

(A) Explain how transition matrix is used identifying web structure? Draw 06 transition matrix for following hypothetical web structure.



	(D)	Describe the structure of web with respect to the following:				
		i. In-component				
		ii. Out-Component				
		iii. Tendrils				
		iv. Tubes				
	(C)) Define Spam Farm. Describe in brief the architecture of a spam farm.				
	(D)	Write a short note on Content –Based Recommendation.				
05		Attempt the following (any Two)				
Q5.		Attempt the following (any Two)	(12)			
Q5.	(A)	Differentiate between Classification and clustering techniques.	(12) 06			
Q3.	(A) (B)	Attempt the following (any Two) Differentiate between Classification and clustering techniques. Briefly explain the k nearest neighbour algorithm.	(12) 06 06			
Q5.	(A) (B) (C)	Attempt the following (any Two) Differentiate between Classification and clustering techniques. Briefly explain the k nearest neighbour algorithm. What is CUR decomposition? Elaborate on choosing Rows and Columns in CUR decomposition.	(12) 06 06 06			

(2 ¹/₂ Hours)

[Total Marks: 60]

N.B:	(]	All questions are compulsory.				
	(2	2) Figures to the right indicate full marks.				
	(3	Assume additional data if necessary but state the same clearly.				
	(4	4) Symbols have their usual meanings and tables have their usual standard de	sign unless			
		stated otherwise.				
	(2	b) Use of calculators and statistical tables are allowed .				
Q.1		Attempt any two of the following	(12)			
	a)	Explain perceptron with the help of a diagram.	6			
	b)	Write a short note on artificial neuron learning. Explain three types of learning.	6			
	c)	What is unsupervised neural network? Explain Hebbian learning rule.	6			
	d)	Write a short note on reinforcement learning.	6			
Q.2		Attempt any two of the following	(12)			
	a)	What are the main components of evolutionary algorithm? Explain Generic evolutionary algorithm.	6			
	b)	Explain basic differential evolution algorithm and explain how it is different from other evolutionary algorithms.	6			
	c)	Define culture in terms of evolutionary computation. Write a pseudocode for cultural algorithm.	6			
	d)	Explain competitive coevolution and its subclasses.	6			
Q.3		Attempt any two of the following	(12)			
	a)	Explain simple ACO algorithm.	6			
	b)	What are the different social network structures have been developed for PSO?	6			
	c)	What are the different applications of ACO?	6			
	d)	Explain different types of division of labor.	6			
Q.4		Attempt any two of the following	(12)			
	a)	Explain the capabilities of Natural Immune system.	6			
	b)	Write a short note on fuzzy operators.	6			
	c)	Explain any six characteristics of fuzzy sets.	6			
	d)	Explain Fuzzy Rule-Based Reasoning System.	6			
Q.5		Attempt any two of the following	(12)			
	a)	Discuss performance measures in supervised learning.	6			
	b)	Define genetic algorithm. Explain three main classes of crossover operators.	6			
	c)	Explain continuous ant colony optimization algorithm.	6			
	d)	What are the main components of fuzzy controllers?	6			
