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### SEMESTER END EXAMINATIONS – DECEMBER 2023

Programme & Branch : B.Tech & CSE,CSE(CS),CSE(IoT)  
 Semester : V Date & Session : 05/12/2023 AN  
 Course Code & Name : CSD 3101 & Theory of Computation  
 Duration : 3 Hours Maximum Marks : 100

ANSWER ALL QUESTIONS

#### PART A (10 X 2 = 20 MARKS)

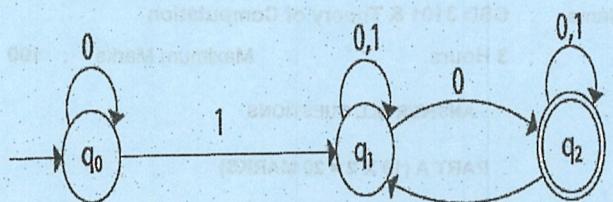
1. Write any four applications of TOC.
2. List the four operations on string.
3. What are the equivalent states in non-deterministic finite automata?
4. Define the term epsilon transition.
5. Give any two examples for regular expression.
6. List any two methods to convert finite automata to regular expression.
7. Find the languages generated by the grammar ( $S \rightarrow aSb, S \rightarrow ab$ )
8. Write the context free grammar for the language  $L = \{ a^n b^n \mid n \geq 1 \}$
9. What are the different types of language accepted by pushdown automata?
10. Write four applications of turing machine.

#### PART B (4 X 16 = 64 MARKS)

- 11.a (i) Prove that the given equation is true for all positive integers. by using mathematical induction.  

$$1 \times 2 + 3 \times 4 + 5 \times 6 + \dots + (2n - 1) \times 2n = 3n(n+1)(4n-1)$$
 (16)  
 (OR)
- b (i) State and prove additional forms of proof in automata theory. (16)
- 12.a (i) Build a DFA that accepts all string on {0,1} except those containing the substring 101. (8)

- (ii) Construct a non-deterministic finite automaton accepting the set of strings over  $\{a,b\}$  ending in aba. Use it to construct a DFA accepting the same set of strings.  
(OR)
- b (i) Given  $L$  is a set accepted by a NFA prove that there exists a DFA that accepts  $L$ .  
(ii) Convert the following non deterministic finite automata (NFA) into deterministic finite automata (DFA).



(8)

(8)

(8)

- 13.a (i) Convert the regular expression into NFA by using Thompson construction method  $(0+1)^*(00+11)$ .  
(OR)
- b (i) Describe the closure properties of regular languages.  
(ii) Show that  $L = \{0^{2n} \mid n \text{ is an integer}, n \geq 1\}$  is not regular.

(16)

(8)

(8)

- 14.a (i) Show the derivation steps and construct derivation tree for the string ababbb.

$$S \rightarrow AB \mid \epsilon$$

$$A \rightarrow aB$$

$$B \rightarrow Sb$$

(8)

(8)

- (ii) Illustrate the grammatical ambiguity and provide an example.  
(OR)

- b (i) Convert the following grammar into GNF.

$$S \rightarrow XA \mid BB$$

$$A \rightarrow b \mid SB$$

$$X \rightarrow b$$

$$A \rightarrow a$$

(16)

- PART C (1 X 16 = 16 MARKS)**
- 15.a (i) Construct a pushdown automata to accept the language  $L = \{a^n b^{2n} \mid n \geq 1\}$ .  
(OR)
- b (i) Design a Turing machine to accept the language  $L = \{0^n 1^n \mid n \geq 1\}$  and simulate its action on the input 0011.

(16)

(16)

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ARREAR SEMESTER END EXAMINATIONS – DECEMBER 2023

Programme & Branch : B.Tech & CSE,CSE(CS)  
Semester : V Date & Session : 12/12/2023 AN  
Course Code & Name : CSCX 114 & Theory of Computation  
Duration : 3 Hours Maximum Marks : 100

ANSWER ALL QUESTIONS

PART A (12 X 2 = 24 MARKS)

1. What is structural induction?
2. Define power of an alphabet.
3. What is epsilon transition?
4. Construct a DFA to accept strings over  $\Sigma = \{a,b\}$  with two consecutive a's.
5. Give the regular expression for set of all strings ending in 00.
6. State pumping lemma for regular set.
7. Write down the context free grammar for the language  $L = \{a^n b^n | n \geq 1\}$ .
8. What do you mean by null production? Give an example.
9. Does a pushdown automaton have memory? Justify.
10. List the primary objectives of push down automata.
11. Write four applications of Turing Machine.
12. Differentiate finite automata and a Turing Machine.

PART B (5 X 12 = 60 MARKS)

- 13.a (i) Prove for every  $n \geq 1$  by mathematical induction  $\sum i^3 = \{(n(n+1)/2)^2, n \geq 1\}$ . (12)  
(OR)
- b (i) Explain the central concepts of automata theory with an example. (12)
- 14.a (i) Construct a DFA accepting binary strings such that the third symbol from the right end is 1. (6)

- (ii) Prove that a Language  $L'$  is accepted by some  $\epsilon$  – NFA if and only if  $L$  is accepted by NFA without  $\epsilon$  transition (6)  
(OR)
- b (i) Convert the following NFA to a DFA.

$\delta$	a	b
p	{p}	{P, q}
q	{r}	{r}
r	{φ}	{φ}

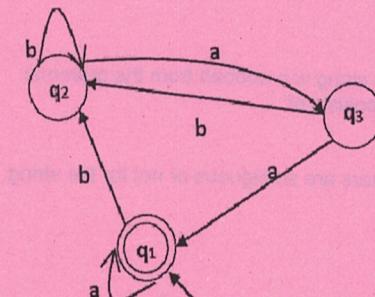
(12)

- 15.a (i) Draw the derivation tree for the string  $w = abbbab$  from the grammar  $G = (\{S, A\}, \{a, b\}, P, S)$  where P consists of  
 $S \rightarrow aAS \mid b$   
 $A \rightarrow SbA \mid ba$ . (6)
- (ii) Prove that the following grammars are ambiguous or not for the string  $w =aab$ . Justify.  
 $S \rightarrow AB \mid aaB$   
 $S \rightarrow AB$   
 $S \rightarrow AaB$   
 $S \rightarrow AaaB$   
 $A \rightarrow a \mid Aa$   
 $B \rightarrow b$  (6)  
(OR)
- b (i) Convert the following grammar into Chomsky Normal Form  
 $S \rightarrow cBA \mid A$   
 $A \rightarrow cB \mid AbbS$   
 $B \rightarrow aaa$  (12)
- 16.a (i) Construct a pushdown automata to accept the language  $L = \{a^m b^n | m, n \geq 1\}$ . (12)  
(OR)
- b (i) Design a push down automata that accepts the language of the grammar and validate for string aaaabb.  
 $S \rightarrow AB$   
 $A \rightarrow aA \mid e$   
 $B \rightarrow aBb \mid e$  (12)
- 17.a (i) Elaborate the programming techniques for Turing Machine constructions with an example. (12)  
(OR)

- b (i) Design a Turing Machine to accept the language  $L = \{0^n1^n \mid n \geq 1\}$  and simulate its action on the input 0011. (12)

**PART C (1 X 16 = 16 MARKS)**

- 18.a (i) Construct a regular expression corresponding to the automata given below (Using Arden's theorem). (8)



(16)

(OR)

- b (i) Construct NFA equivalent to the regular expression  $((0+1)(0+1)(0+1))^*$  by using Thompson's construction rule. (8)  
(ii) Justify that  $L = \{a^i b^j \mid i \geq 0\}$  is not regular using pumping lemma. (8)

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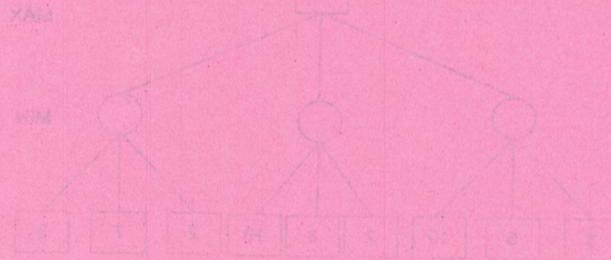
(8)

(8)

**QUESTION PAPER**

QUESTION PAPER - ENCODED IN THE AUTOMATA

newly added and to mitigate potential steel fatigue to prevent end disassembly (ii) a M  
car



newly added and to mitigate potential steel fatigue to prevent end disassembly (ii) a M  
car

(8)

Explain about main differences

between hill climbing and simulated annealing techniques. (8)

#### PART A (10 X 2 = 20 MARKS)

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Explain about main differences

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Explain about main differences

#### PART A (10 X 2 = 20 MARKS)

Programme & Branch	:	B.Tech CSE,CSE(CS) & CSE(IoT)
Semester	:	V
Date & Session	:	14/12/2023 & AN
Course Code & Name	:	CSD 3102 & Artificial Intelligence Techniques
Duration	:	3 Hours
Maximum Marks	:	100

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#### SEMESTER END EXAMINATIONS – DECEMBER 2023

ANSWER ALL QUESTIONS

#### PART A (10 X 2 = 20 MARKS)

1. (a) Name two areas where machines cannot excel human beings.
2. List the various informed search strategy.
3. Differentiate BFS and DFS.
4. (b) State the purpose of hill climbing technique.
5. Write the predicate logic for the statement below  
 H1: All men are mortal  
 H2: Shakespeare is a man
6. Write the semantics of the universal and existential quantifiers.
7. Define planning agent.
8. (a) What is knowledge based planning?
9. (b) List any two disadvantages of implementing robots in medical industry.
10. Mention the importance of knowledge acquisition.

#### PART B (4 X 16 = 64 MARKS)

- 11.a (i) Consider a following Water Jug Problem: You are given two jugs, a 4-gallon one and a 3-gallon one, a pump which has unlimited water which you can use to fill the jug, and the ground on which water may be poured. Neither jug has any measuring markings on it. How can you get exactly 2 gallons of water in the 4-gallon jug? (16)  
 (OR)
- b (i) Solve the 8-Queens problem using backtracking strategy and explain. (16)

- 12.a (i) Apply A\* search algorithm for the below given tree. Discuss how it is applied in route finding.

Node	H(n)
A	12
B	4
C	7
D	9
E	8
F	2
H	4
I	9
S	13
G	0

(8)

- (ii) Explain any two informed search strategies with examples.  
(OR)

- b (i) Elaborate the working of backward and forward reasoning techniques with suitable facts and goal.

(16)

- 13.a (i) Write down logical representations for the following sentences
  - Horses, cows, and pigs are mammals
  - Bluebeard is a horse.
  - Every mammal has a parent.
  - An offspring of a horse is a horse
(10)

- (ii) Briefly discuss the means end analysis.  
(OR)

- b (i) Describe STRIPS representation for block world problem.  
(ii) Explain any two types of planning system with examples.

(8)

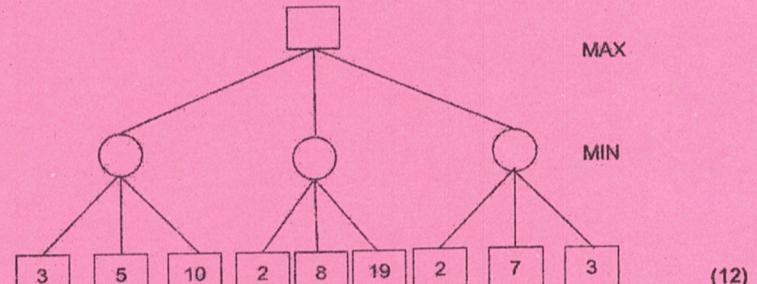
(8)

Collapsing a pile of stones can do it. moving a pile of stones is a relation. If a pile of stones falls down, then it will be collapsed and it will be a pile of stones. Collapsing a pile of stones is a relation. If a pile of stones falls down, then it will be collapsed and it will be a pile of stones. If no stones are present, then it is not possible to collapse a pile of stones. If no stones are present, then it is not possible to collapse a pile of stones.

(OR)

(8)

- 14.a (i) Illustrate the working of Alpha Beta pruning algorithm for the below given tree.



(12)

- (ii) Can robots replace human beings? Justify your answer.

(OR)

- b (i) Explain expert system architecture.

(8)

- (ii) Describe any two types of expert system with neat diagrams.

(8)

### PART C (1 X 16 = 16 MARKS)

- 15.a (i) Consider the Wumpus world with following reward system  
+100 reward in gold cell  
-100 penalty for Wumpus cell  
-5 in the pit cell  
-10 for each section  
+5 for breeze cell. Analyze all the steps to solve the Wumpus world problem

(16)

(OR)

- b (i) Consider the AI Farmer-Fox-Goose-Grain puzzle, a farmer wishes to cross a river taking his fox, goose, and grain with him. He can use a boat which will accommodate only the farmer and one possession.

Rules:

- If the fox is left alone with the goose, the goose will be eaten and If the goose is left alone with the grain it will be eaten.
- How many journeys will be taken to cross river?
- Draw a state space search tree for this puzzle using left bank and right bank to denote left and right banks respectively.

(16)

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**ARREAR SEMESTER END EXAMINATIONS – DECEMBER 2023**

Programme& Branch : B.Tech CSE,CSE(IoT)&CSE(CS)  
Semester : V Date & Session : 14/12/2023 & AN  
Course Code & Name : CSC 3103 & Artificial Intelligence and Machine Learning  
Duration : 3 Hours Maximum Marks : 100

**ANSWER ALL QUESTIONS**

**PART A (12 X 2 = 24 MARKS)**

1. State any four advantages of the production system.
2. What is the purpose of problem solving agent in an intelligent system?
3. How searching is done in game tree?
4. Give any four examples of control strategies for resolution methods.
5. What is inference in Artificial Intelligence (AI)?
6. Difference between uninformed search and informed search.
7. Mention the need of a plan generation system.
8. Define forward production system.
9. Draw the flowchart of semi-supervised learning.
10. Define machine learning with example.
11. What is data set collection?
12. Mention any four applications of machine learning technique.

**PART B (5 X 12 = 60 MARKS)**

- 13.a (i) Elaborate on different types of uninformed graph search methodologies with examples. (12)  
(OR)
- b (i) Discuss the role of the agent function in the structure of an intelligent agent. (12)

- 14.a (i) Describe the control knowledge for rule based deduction system with an example. (12)

(OR)

- b (i) Compare and contrast forward deduction system and backward deduction system. (12)

- 15.a (i) Explicate the major functions in non-linear planning system. (6)  
(ii) Summarize the way of representing actions and goals of Stanford Research Institute Problem solver (STRIPS). (6)

(OR)

- b (i) Discuss basic plan generating system in Artificial Intelligence (AI). (6)  
(ii) Explain the various knowledge representation schemes used in problem solving mechanism. (6)

- 16.a (i) Analyze and solve the given dataset using Naïve Bayes classifier where 'Severe' indicates the presence of symptom, 'Mild' indicates the absence of symptom, 'Moderate' indicates the moderate presence or absence of symptom. The status 'Yes' indicates the person is sick and 'No' denotes the person is healthy. Identify a person who has severe running nose with moderate cough, moderate reddened skin and mild fever is sick or healthy. (12)

Sl.No	Running nose	Cough	Reddened skin	Fever	Status
1	Severe	Severe	Moderate	Mild	Yes
2	Moderate	Severe	Mild	Mild	Yes
3	Mild	Mild	Severe	Severe	Yes
4	Severe	Mild	Mild	Mild	No
5	Mild	Moderate	Moderate	Mild	No
6	Moderate	Severe	Severe	Moderate	No
7	Severe	Mild	Mild	Severe	Yes
8	Severe	Severe	Severe	Moderate	Yes
9	Severe	Mild	Mild	Severe	Yes
10	Mild	Mild	Mild	Mild	No

(12)

CSC 3103

CSC 3103

(OR)

- b (i) Apply a suitable regression model to predict the salary of an employee if the number of years of experience is 3. The number of years of service and the monthly income of the employee of a company is as follows.

Years of experience	11	7	9.5	5	8.5	.6	10
Salary (in thousands)	10.5	8.5	6	5	9.5	10	11

(12)

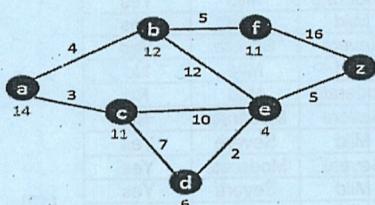
- 17.a (i) Describe any two tools involved in machine learning technique for dataset collection. (6)  
(ii) Illustrate the steps involved in classification of face spoof detection in Artificial Neural Network(ANN). (6)

(OR)

- b (i) Explain house price prediction mechanism in machine learning. (6)  
(ii) Discuss the loan application classification with a supervised machine learning algorithm. (6)

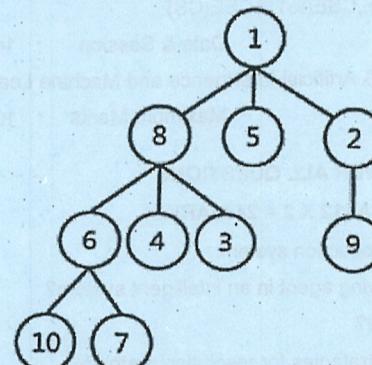
**PART C (1 X 16 = 16 MARKS)**

- 18.a (i) Apply A\* algorithm in the following graph given below and find the shortest path to travel from "a" to "z" in an optimized way.



(16)

- b (i) Apply the Breadth-First Search(BFS) algorithm in the following graph given below with " 1 " as initial state and "10" as the goal state , find a proper sequence of transitions to reach the goal state.



(16)

[EXAM FORM NO. 3 FOR MARKS]

CSD 3104

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**SEMESTER END EXAMINATIONS – DECEMBER 2023**

Programme & Branch : B.Tech CSE, CSE (CS), CSE (IoT).  
Semester : V Date & Session : 19/12/2023 AN  
Course Code & Name : CSD 3104 & Data Mining and Data Warehousing.  
Duration : 3 Hours Maximum Marks : 100

**ANSWER ALL QUESTIONS**

**PART A (10 X 2 = 20 MARKS)**

1. What are the different data mining tasks?
2. Mention the concept of support in association mining.
3. Differentiate between OLAP and OLTP.
4. What do you mean by frequent item set?
5. Define Bayes theorem.
6. In what way SVM is different from decision tree.
7. Give the uses of outlier analysis.
8. State the types of partitioning methods.
9. What do you mean by web mining?
10. List any two applications of text mining.

**PART B (4 X 16 = 64 MARKS)**

- 11.a (i) Discuss about data preprocessing techniques. (8)  
(ii) Build a data cube and perform OLAP operations. (8)
- (OR)
- b (i) Discuss and distinguish supervised and unsupervised learning. (8)  
(ii) Describe various types of schemas used in data mining (8)

- 12.a (i) A database has 4 transactions, shown below. Assuming a minimum level of support  $\text{min\_sup} = 60\%$  and a minimum level of confidence  $\text{min\_conf} = 80\%$ . Find all frequent item sets (not just the ones with the maximum width/length) using the Apriori algorithm.

TID	Date	items_bought
T100	10/15/04	{K, A, D, B}
T200	10/15/04	{D, A, C, E, B}
T300	10/19/04	{C, A, B, E}
T400	10/22/04	{B, A, D}

(8)

- (ii) Discuss in detail about pattern evaluation methods.

(8)

(OR)

- b (i) Explain Market Basket analysis and how it can help in a supermarket?  
(ii) Explain Star, Snow Flake and Fact Constellation schemas.

(8)  
(8)

- 13.a (i) Describe about the classification process done using decision tree using an example.  
(ii) Explain about Support Vector Machines in detail.

(8)  
(8)

(OR)

- b (i) Discuss about Bayesian classification using an example

(16)

- 14.a (i) Explain Indexing with suitable examples.  
(ii) Distinguish and describe about agglomerative and divisive clustering.

(OR)

- b (i) Illustrate about the density based methods.  
(ii) Discuss about the types of data in cluster analysis

**PART C (1 X 16 = 16 MARKS)**

- 15.a (i) Demonstrate about two major applications of Data mining in medical and business using a case study.

(16)

(OR)

- b (i) If your dataset contains missing value, discuss the basic analysis and the corresponding decisions you will take in the preprocessing phase of the data mining process. Develop a software tool for the detection of outliers if the data for preprocessing are given in the form of a flat file with n-dimensional samples.

(16)

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CSDX 111

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SEMESTER END EXAMINATIONS – DECEMBER 2023

Programme & Branch : B.Tech CSE, CSE(CS) & CSE(IoT)  
Semester : V Date & Session : 20/12/2023 AN  
Course Code & Name : CSDX 111 – Foundation on Robotics  
Duration : 3 Hours Maximum Marks : 100

ANSWER ALL QUESTIONS

PART A (10 X 2 = 20 MARKS)

1. What is meant by pitch, yaw and roll?
2. Sketch a robot and name its parts.
3. Give the types of end effectors.
4. State the properties of a stepper motor.
5. Name any two algorithms for image enhancement application.
6. Identify the three levels of safety sensor systems in robotics defined by National Bureau of Standards.
7. Perform translation on vector  $v = 25i+10j+20k$  by a distance of 8 units in "X" direction, 5 units in "Y" direction and 0 units in "Z" direction.
8. What are the motion commands available in VAL programming?
9. Define AGV.
10. List out the few robot applications area in manufacturing.

PART B (4 X 16 = 64 MARKS)

- 11.a (i) Describe in detail the anatomy of an industrial robot  
(ii) Summarize the industrial robots and briefly describe it.

(08)

(08)

(OR)

- b (i) Classify the robots according to the coordinates of motion. With a sketch and example, explain the features of each type. (08)  
(ii) With a neat sketch explain the three degrees of freedom associated with the robot wrist. (08)
- 12.a (i) Explain with suitable illustration, the working of external and internal grippers. (16)  
(OR)  
(b) (i) Discuss the performance characteristics of actuators. Compare the characteristics of electrical, pneumatic & hydraulic actuators. (16)
- 13.a (i) Analyze the segmentation methods used in vision system with suitable example. (16)  
(OR)  
(b) (i) Explain machine vision system with a real time application. (16)
- 14.a (i) Classify the features of various programming methods used in robotics with examples. (16)  
(OR)  
(b) (i) Outline the manual lead through programming in robot application. (16)
- PART C (1 X 16 = 16 MARKS)**  
Develop a VAL robot program to perform pick and place operation on the conveyer system. It consists of two conveyors running parallel with center distance of 600 mm at same level. An industrial robot is fixed centrally between the conveyors. The robot is used to transfer work pieces from conveyor 1 to 2 at a constant speed.  
Draw a schematic view of the system. (16)  
(OR)  
Criticize various difficulties associated with the inverse kinematic

**CSDX 111**

**CSDX 111**

(Q1) (a) solution and explain 'geometric approach' used in inverse kinematic problem.

(16)

(Q2) (b) Explain the geometric approach used in inverse kinematics problem.

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(Q3) (c) Explain the geometric approach used in inverse kinematics problem.

(16)

(Q4) (d) Explain the geometric approach used in inverse kinematics problem.

(16)

(Q5) (e) Explain the geometric approach used in inverse kinematics problem.

(16)

(Q6) (f) Explain the geometric approach used in inverse kinematics problem.

(16)

(Q7) (g) Explain the geometric approach used in inverse kinematics problem.

(16)

(Q8) (h) Explain the geometric approach used in inverse kinematics problem.

(16)

(Q9) (i) Explain the geometric approach used in inverse kinematics problem.

(16)

(Q10) (j) Explain the geometric approach used in inverse kinematics problem.

(16)

(Q11) (k) Explain the geometric approach used in inverse kinematics problem.

(16)

(16)

Q1  
Q2  
Q3  
Q4  
Q5  
Q6  
Q7  
Q8  
Q9  
Q10  
Q11

GEWESTER END EXAMINATIONS - DECEMBER 2023

Category	Subject	Section	Question	Mark
Geometrical Approach	CSDX 111 - Programming	Q1	Q1	16
			Q2	16
Geometrical Approach	CSDX 111 - Programming	Q3	Q3	16
			Q4	16
Geometrical Approach	CSDX 111 - Programming	Q5	Q5	16
			Q6	16
Geometrical Approach	CSDX 111 - Programming	Q7	Q7	16
			Q8	16
Geometrical Approach	CSDX 111 - Programming	Q9	Q9	16
			Q10	16
Geometrical Approach	CSDX 111 - Programming	Q11	Q11	16
			Q12	16

NUMBER OF QUESTIONS

(16) X 12 = 192 MARKS

Time limit: 3 hours, 30 minutes. Total marks: 192. Total questions: 12. Total marks per question: 16. Total marks per section: 16. Total marks per paper: 192.

Examination time: 3 hours, 30 minutes. Total marks: 192. Total questions: 12. Total marks per question: 16. Total marks per section: 16. Total marks per paper: 192.

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**SEMESTER END EXAMINATIONS – DECEMBER 2023**

Programme & Branch : B.Tech CSE, CSE (IoT), CSE (CS)  
 Semester : V Date & Session : 16.12.2023 & AN  
 Course Code & Name : CSDX 104 & Virtualization Techniques  
 Duration : 3 Hours Maximum Marks : 100

**ANSWER ALL QUESTIONS**

**PART A (10 X 2 = 20 MARKS)**

1. Define moore's law.
2. What is virtualization?
3. State the drawbacks of virtual machines.
4. List the uses of a hypervisor.
5. What is the use of microsoft disk2vhd?
6. Compare process virtual machines and system virtual machines.
7. How does virtualization solve business problems?
8. List the limitations of server virtualization.
9. What is mean by symmetric virtualization?
10. Differentiate storage area network and network attached storage.

**PART B (4 X 16 = 64 MARKS)**

- 11.a (i) Discuss the necessity of virtualization and describe system level virtualization. (16)  
 (OR)  
 b (i) Explain desktop virtualization and its application with neat diagram. (16)
- 12.a (i) Discuss network virtualization and explain the advantages and disadvantages of network virtualization. (16)  
 (OR)  
 b (i) Elaborate the CPU virtualization and its types. (10)  
 (ii) Discuss the role of software-defined networking in the context of network virtualization. (6)



- 13.a (i) Discuss hyper threading in virtualization. (12)  
(ii) List the benefits of memory virtualization. (4)

(OR)

- b (i) Explain full virtualization and paravirtualization with neat diagram. (16)

- 14.a (i) Describe the calculation of memory overhead and memory optimization. (16)

(OR)

- b (i) Elaborate the need of backup virtual machine. Write a procedure to backing up and recovering a virtual machine. (12)

- (ii) Explain the key features and advantages of using virtual box as a virtualization solution. Provide detailed insights into its networking capabilities, snapshot functionality, and support for different operating systems. (4)

### PART C (1 X 16 = 16 MARKS)

- 15.a (i) Imagine you are tasked with implementing storage virtualization in an enterprise environment. Describe a scenario where storage virtualization could significantly benefit application performance and data management. What are the key advantages of using storage virtualization in this context, and how would you address potential challenges or concerns? (16)

(OR)

- b (i) Create clear diagrams to illustrate the procedures involved in network virtualization tuning practices. (16)