SHRI VAISHNAV VIDYAPEETH VISHW

Total No. of Questions: 05

Total No. of Printed Pages: 02

Roll No. 23100BTCSE1S139

BTDSE511M

B.Tech./ B.Tech.+ M.Tech./ B.Tech.+ M.B.A. (CSE, CSE-MA, IT)

V Semester Examination, Dec.'25-Jan.'26

Image Processing

Choice Based Credit System (CBCS)

Duration: 3 Hrs. **Maximum Marks : 60**

Minimum Pass Marks: 24

Note: (1) All questions carry equal marks, out of which part 'A' and 'B' carry 3 marks and part 'C' carries 6 marks.

(2) From each question, part 'A' and 'B' are compulsory, and part 'C' has internal choice.

(3) Draw neat diagram, wherever necessary.

(4) Assume suitable data wherever necessary.

Q.1.(A) Describe commonly used image file formats in digital image processing and highlight their key characteristics. **03**

(B) Define a digital image and explain how it can be represented in matrix form. **03**

(C) Discuss 4-neighborhood and 8-neighborhood measures. Mention suitable applications for each. **06**

OR

Describe briefly geometric and photometric models used in image processing.

Q.2.(A) Define spatial filtering and explain its purpose in image enhancement. **03**

(B) Explain the principles of LoG and DoG filters and state their applications. **03**

(C) What is histogram equalization? Illustrate with an example. **06**

OR

Describe different types of intensity transformations, such as logarithmic and power-law transformations.

Q.3.(A) Explain the region growing technique used for image segmentation. **03**

(B) Define edge linking and describe how the Hough Transform is used to link edges into meaningful structures. **03**

(C) Explain how Bayes analysis is applied in image segmentation. Describe Otsu's method for automatic threshold selection. **06**

OR

Explain the working of Sobel edge detection operators with a suitable example.

Contd.....

Q.4.(A) Explain the Gray-Level Co-occurrence Matrix (GLCM) and how it is used to extract texture features. **03**

(B) Describe the concept and purpose of skeletonization (thinning) in image analysis. **03**

(C) Explain connected component analysis (CCA) and the convex hull of an object, with an example. **06**

OR

Define image registration and differentiate between mono-modal and multi-modal registration with applications.

Q.5.(A) Discuss the significance of color information in image analysis and computer vision. **03**

(B) Explain the HSI color model and describe how it separates intensity from color components. **03**

(C) Define erosion and dilation. How dilation and erosion can be used for noise reduction in images? **06**

OR

How do morphological operations differ from traditional image filtering techniques?

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SHRI VAISHNAV VIDYAPEETH VISHWAVIDYALAYA, INDORE

Shri Vaishnav Institute of Information and Technology

Department of Computer Science Engineering

MST-I

Subject Code: BTDSE511M | Subject Name: Image Processing | Sem: V

Time: 1 Hours | Max Mark: 20

Note: All questions are compulsory. Assume suitable missing data

Que.1 (a) List any 3 commonly used image file formats and specify their characteristics.	3	CO1
(b) Describe *neighborhood metrics*. Why are they essential in defining image structure?	3	CO1
(c) Explain the concept of *geometric* image formation models with suitable diagram.	4	CO1
OR		
(d) Define *Spatial and Gray Scale Resolution*. How are they important in digital image processing?		
Que.2 (a) Interpret the effect of applying a *smoothing filter* on a noisy image.	3	CO2
(b) State the concept *contrast stretching*.	3	CO2
(c) Demonstrate spatial convolution with 3×3 laplacian mask on sample 5×5 image matrix.	4	CO2
OR		
(d) Apply the histogram equalization technique on any 5×5 image and show the before-and-after histograms.		

CO1: Define key concepts, terminologies related to image processing systems and their applications.
CO2: Apply intensity transformations for image enhancement.

Total No. of Questions: 05

Total No. of Printed Pages: 02

Roll No. 23100 BT CSE 15139

BTCS501N

B.Tech./ B.Tech.+ M.Tech./ B.Tech.+ M.B.A. (CSE, CSE-MA, CSE-AII, CSE-AIML, CSE-BDCE, CSE-DSI, CSE-FSDI, CSE-ICS, CSE-CMCI, CSE-MLCCG, IT)

V Semester Examination, Dec.'25-Jan.'26

Theory of Computation

Choice Based Credit System (CBCS)

Time: 3 Hrs.

Maximum Marks: 60

Minimum Pass Marks: 24

Note: (1) All questions carry equal marks, out of which part 'A' and 'B' carry 3 marks and part 'C' carries 6 marks.

(2) From each question, part 'A' and 'B' are compulsory and part 'C' has internal choice.

(3) Draw neat diagram, wherever necessary.

(4) Assume suitable data wherever necessary.

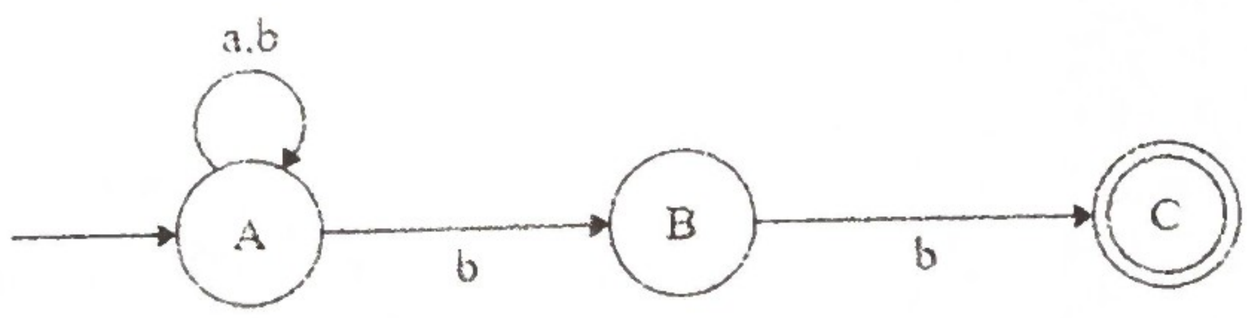
Q.1(A) Define deterministic finite automaton (DFA) with suitable example. **03**

(B) Construct a DFA for the language of strings over {0,1} that end with 001. **03**

(C) Build an NFA for the language of strings over {0,1} where the third symbol from the end is 1. **06**

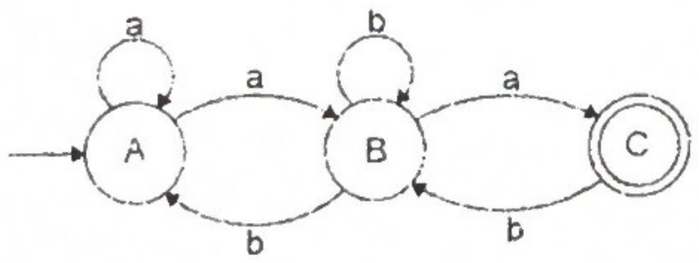
OR

Convert the following NFA to DFA:



Q.2(A) Construct a regular expression for strings over {a,b} that start with 'a' and end with 'b'. **03**

(B) Write regular expression for following finite state machine using Arden's theorem: **03**



(C) State the pumping lemma for regular languages and prove that the following set is not regular: $L = \{ a^n b^{5n}, n>=1 \}$ **06**

OR

Explain closure properties of regular languages with examples.

Contd.....

Q.3(A)	Define a context-free grammar (CFG) with suitable example.		**03**
(B)	Describe ambiguity in a CFG with an example.		**03**
(C)	Illustrate the Closure properties of CFLs.		**06**
	OR		
	Design a CFG for the language L={ $a^i b^j c^k$, i=j or j=k } .		
Q.4(A)	Describe acceptance by Final state and acceptance by empty stack PDA.		**03**
(B)	Differentiate between deterministic PDA (DPDA) and nondeterministic PDA (NPDA).		**03**
(C)	Construct a PDA for the language L={$a^n b^{3n}$ | n>=0} .		**06**
	OR		
	Design a PDA for the language of strings over {0,1} where the number of 0s equals the number of 1s.		
Q.5(A)	Differentiate between recursive and recursively enumerable languages.		**03**
(B)	Explain the halting problem and why it is undecidable?		**03**
(C)	Construct a Turing machine that accepts the language L= { $0^n 1^n 2^n$ | n >=1}.		**06**
	OR		
	Illustrate P, NP, NP hard and NP complete problems with example.		

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SHRI VAISHNAV VIDYAPEETH VISHWAVIDYALAYA, INDORE

Shri Vaishnav Institute of Information Technology

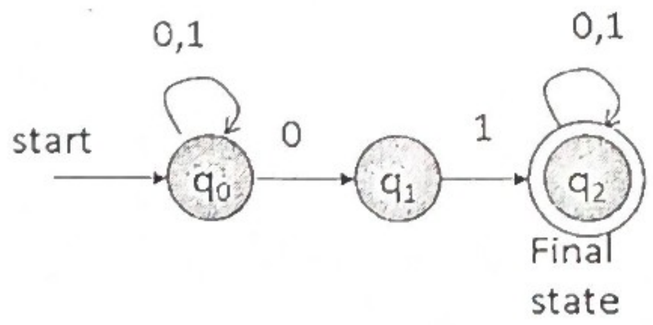
Department of Computer Science and Engineering

MST I

Subject Code: BTCS501 Subject Name: Theory of Computation Semester: V

Time: 1 Hour **Total Marks:** 20

Note: All questions are compulsory. Assume suitable missing data

Question No.	Question	Marks	Related CO
1.	a) Define DFA with suitable examples.	3	CO1
	b) Describe Language of finite automata with example.	3	CO1
	c) Construct a finite automaton which accepts all combinations of 0 & 1 such that each string should have '01' as substring.	4	CO2
	OR		
	d) What is a regular expression, explain with an example.		CO2
2.	a) Convert the following NFA into its equivalent DFA. 	3	CO1
	b) Describe the Closure properties of Regular Sets.	3	CO1
	c) Prove that the given language is not regular using pumping lemma : $L = \{a^n b^n, n>=0\}$	4	CO2
	OR		
	d) Explain Arden's Theorem with suitable examples.		CO2

CO1	Ability to relate practical problems to languages, automata, and computability.
CO2	Ability to demonstrate an increased level of mathematical sophistication.
CO3	Ability to apply mathematical and formal techniques for solving problems

SHRI VAISHNAV VIDYAPEETH VISHWAVIDYALAYA, INDORE

Shri Vaishnav Institute of Information Technology

Department of Computer Science and Engineering(CSE/ISCC)

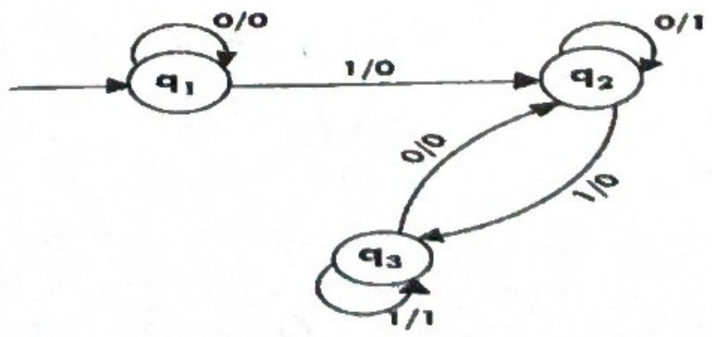
RE-MST II

Subject Code: BTCS501N **Subject Name:** Theory of Computation **Semester: V**

Branch/Section: CSE/ISCC **Time:** I Hour **Total Marks:** 20

Note: All questions are compulsory. Assume suitable missing data

Question No.		Marks	Related CO
1.a)	Consider the following grammar and eliminate left recursion- $A \rightarrow ABd / Aa / a$ $B \rightarrow Be / b$	3	[CO1]
b)	Explain PDA with the help of example.	3	[CO2]
c)	Check whether the given grammar is ambiguous or not **S → SS** **S → a** **S → b** For the string w= abba	4	[CO2]
	OR		
d)	Convert the following Mealy machine into equivalent Moore machine.	4	[CO2]



2. a)	Define grammar with all four tuples and find L(G)= ? Where P={ S->aAb A->aAb/ ϵ}	3	[CO1]

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Shri Vaishnav Institute of Information Technology
Department of Computer Science and Engineering(CSE/ISCC)

b) Consider the context free grammar given below and remove unit production for the same. 3 [CO3]

S->0A|1B|C
A->0S|00
B->1|A
C->01

c) Remove the null productions from the following grammar 4 [CO3]

$S \rightarrow XYX$
$X \rightarrow 0X \mid \varepsilon$
$Y \rightarrow 1Y \mid \varepsilon$

OR

d) Remove the useless symbol from the given context free grammar: 4 [CO1]

S -> aB / bX
A -> Bad / bSX / a
B -> aSB / bBX
X -> SBD / aBx / ad

CO1	Ability to analyze and modify context-free grammars for language generation and simplification, including left recursion and identification of useful symbols.
CO2	Ability to convert context-free grammars into standard forms such as Chomsky Normal Form (CNF) and analyze state machines to derive equivalent models and regular expressions.
CO3	Ability to simplify context-free grammars by removing unit and null productions, ensuring an efficient representation of languages.

Total No. of Questions: 05

Total No. of Printed Pages: 02

Roll No. 2310OBTCSE1S133

BTCS502N

B.Tech./ B.Tech.+ M.Tech./ B.Tech.+ M.B.A.(CSE, CSE-MA, CSE-AIML, CSE-BDCE, CSE-ICS, CSE-MLCCG, IT)

V Semester Examination, Dec.'25-Jan.'26

Introduction to Artificial Intelligence

Choice Based Credit System (CBCS)

Time: 3 Hrs. **Maximum Marks: 60**

Minimum Pass Marks: 24

Note: (1) All questions carry equal marks, out of which part 'A' and 'B' carry 3 marks and part 'C' carries 6 marks.
(2) From each question, part 'A' and 'B' are compulsory and part 'C' has internal choice.
(3) Draw neat diagram, wherever necessary.
(4) Assume suitable data wherever necessary.

Q.1(A) Describe AI brief history and draw AI evolution Time line. **03**

(B) Explain different AI technologies and its applications. **03**

(C) Define state space and describe the state space representation of the given problem: **06**

(a)Tic Tac Toe (b)Travelling Salesman problem.

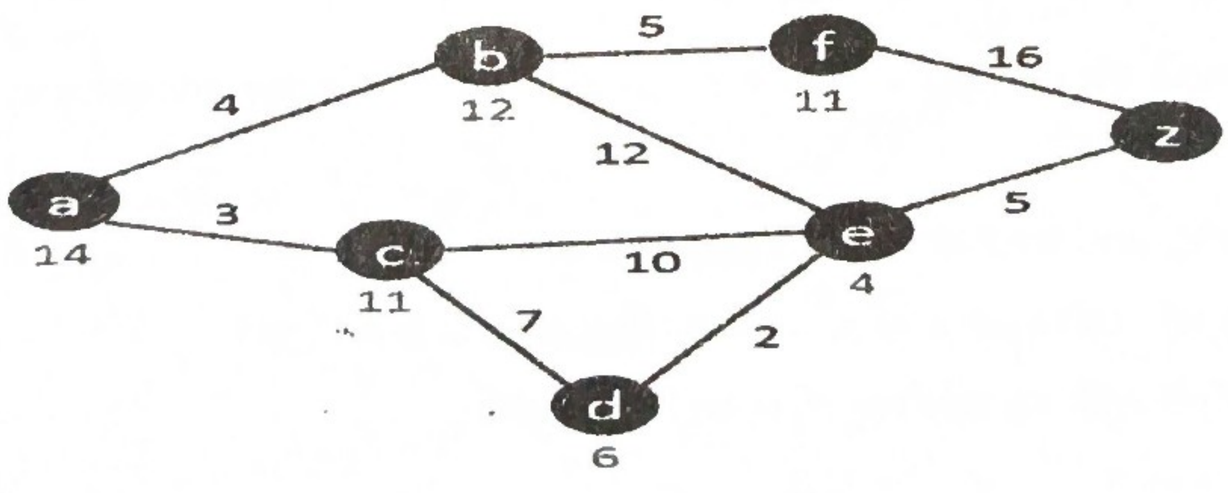
OR

What is an intelligent agent? Describe in detail Reflex agent and Utility-based agent.

Q.2(A) Explain the importance of heuristic function in Informed search technique. What is admissible heuristic? **03**

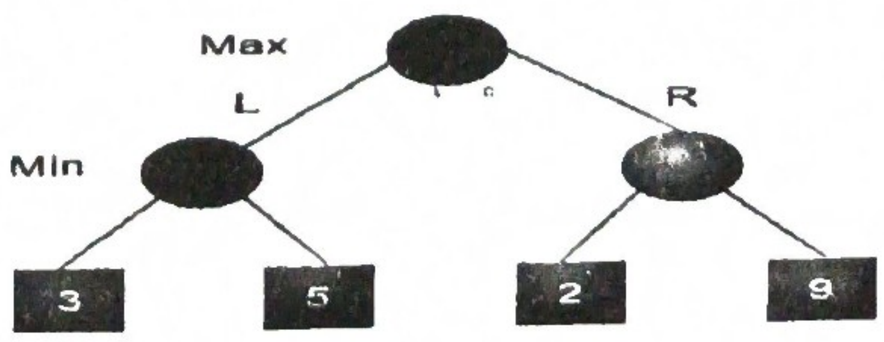
(B) Differentiate between Breadth First Search and Depth First Search algorithm. **03**

(C) Explain the working of A* algorithm. Find the shortest path and cost from node A to Z in the following graph using A* algorithm : **06**



OR

Differentiate between Minimax and Alpha-Beta pruning game search algorithm. Find the nodes values using the Minimax algorithm



Contd.....

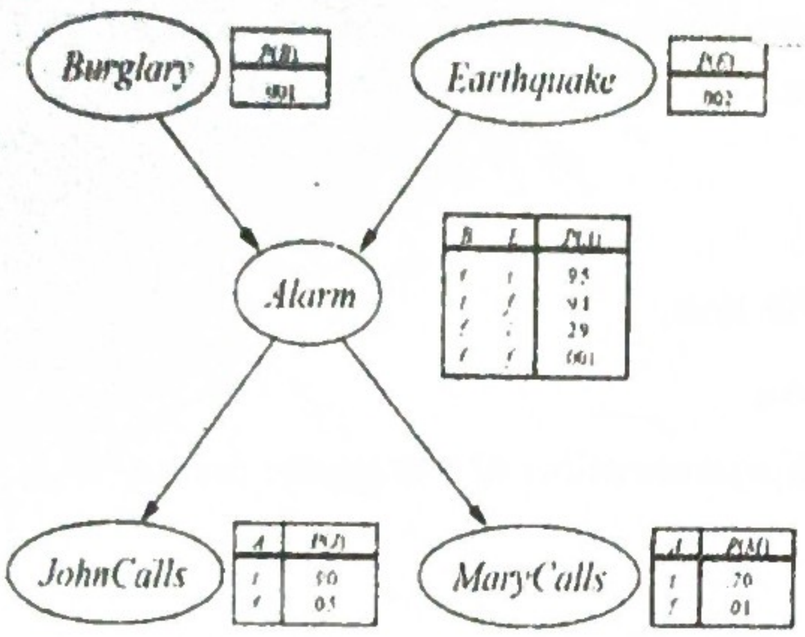
Q.3(A) Explain conditional probability and Bayes theorem with a suitable example. **03**

(B) What is a Bayesian Network? List any three components of a Bayesian Network. **03**

(C) A medical test is used to detect a disease,1% of people have the disease → $P(Disease) = 0.01$, If a person has the disease, the test is positive 99% of the time → $P(Pos \mid Disease) = 0.99$, If a person does not have the disease, the test is still positive 5% of the time → $P(Pos \mid NoDisease) = 0.05$. Find: The probability that a person actually has the disease given that they tested positive. That is, $P(Disease \mid Pos)$. **06**

OR

Calculate the probability that alarm has sounded, but there is neither a burglary, nor an earthquake occurred, and John and Mary both called. GivenP(B)=0.01,P(E)=0.02,



B	E	P(A)
t	t	.95
t	f	.94
f	t	.29
f	f	.001

A	P(M)
t	.70
f	.01

A	P(J)
t	.90
f	.05

Q.4(A) What is a Markov Decision Process (MDP)? List the four main components of an MDP. **03**

(B) What is policy iteration? Compare Policy Iteration and Value Iteration. **03**

(C) Describe Hidden Markov Model and it's applications. A given scenario where the initial probability are P(rain)=0.5 and P(Dry)= 0.8 P(R|R)=0.4,P(D|D)=0.6,P(D|R)0.5,P(R|D)0.3), find the probability of the sequence of state P{Dry,Dry,Rain,Rain}. **06**

OR

Describe utility theory in detail. How does it help in decision-making under uncertainty?

Q.5(A) Define reinforcement learning and explain its key components. **03**

(B) What is the difference between passive and active reinforcement learning? **03**

(C) Describe Q-learning algorithm with its update rule and example. **06**

OR

Describe temporal difference (TD) learning and compare it with Monte-Carlo learning.

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SHRI VAISHNAV VIDYAPEETH VISHWAVIDYALAYA, INDORE

Shri Vaishnav Institute of Information Technology

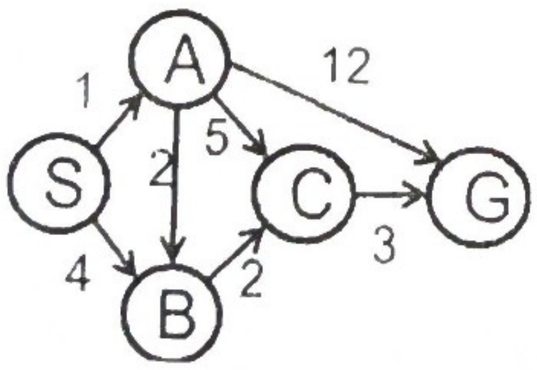
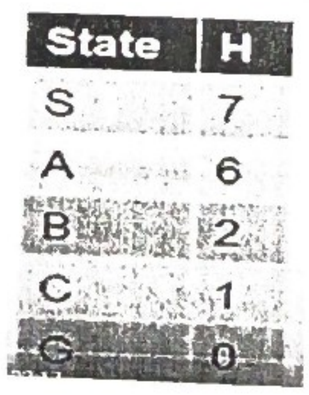
Department of Computer Science and Engineering

MST 1

Subject Code: BTCS502N
Subject Name: Introduction to Artificial Intelligence **Semester: V**

Time: 1 Hour **Total Marks**: 20

Note: All questions are compulsory. Assume suitable missing data

Q.no			Marks	CO
1	A	Discuss about history of Artificial Intelligence and the Turing Test.	3	CO 1
	B	Explain the state space representation of the 8 puzzle AI problem.	3	CO 1
	C	Describe Goal based AI agents and Utility based AI agent.	4	CO 1
		OR		
	D	Differentiate between Search Graph and Search Tree.	4	CO 1
2	A	Describe the importance of the Heuristic function in the Informed search algorithm	3	CO 1
	B	Differentiate between Breadth First Search(BFS) and Depth First Search (DFS)algorithm	3	CO 1
	C	Explain A* algorithm and find out the shortest path and its cost from node S to node G for the given below graph using A* algorithm  	4	CO 2
		OR		
	D	Explain Minimax and Alpha-Beta game search algorithm .	4	CO 2

CO1	Build intelligent agents for search and games
CO2	Solve AI problems through programming with Pyhon

Total No. of Questions: 05

Total No. of Printed Pages: 02

Roll No. 23001BTCSE151337

BTCS503M

B.Tech./ B.Tech+ M.Tech./ B.Tech.+ M.B.A.(CSE, CSE-MA, CSE-AIML, CSE-BDCE, CSE-ICS, IT)

V Semester Examination, Dec.'25-Jan.'26

Network Security and Cryptography

Choice Based Credit System (CBCS)

Duration: 3 Hrs. **Maximum Marks : 60**

Minimum Pass Marks: 24

Note: (1) All questions carry equal marks, out of which part 'A' and 'B' carry 3 marks and part 'C' carries 6 marks.

(2) From each question, part 'A' and 'B' are compulsory and part 'C' has internal choice.

(3) Draw neat diagram, wherever necessary.

(4) Assume suitable data wherever necessary.

Q.1.(A) What are common threats that can compromise network security? **03**

(B) What is strong authentication? Explain with example. **03**

(C) Explain the design principle of Security in detail. **06**

OR

Differentiate between Active and Passive attacks.

Q.2.(A) Differentiate Symmetric and asymmetric key Cryptography. **03**

(B) Explain the concept of Key Range and Key Size. **03**

(C) How do substitution techniques alter the original message in cryptography? **06**

OR

What are some common password cracking techniques? Explain.

Q.3.(A) What is symmetric key cryptography? Explain with diagram. **03**

(B) How does Double DES enhance security compared to single DES? **03**

(C) How does IDEA differ from other encryption algorithms like DES or AES? **06**

OR

What is AES algorithm? What is the maximum key length of AES?

Q.4.(A) Differentiate between DoS and DDoS Attacks. **03**

(B) What is the purpose of the Diffie-Hellman Key Exchange? **03**

Contd.....

(C) How do symmetric and asymmetric key cryptography work together to secure data transmission? **06**

OR

How does the RSA algorithm encrypt and decrypt data?

Q.5.(A) What is steganography in information Security? **03**

(B) What does authentication mean in computer security? **03**

(C) How do PGP and S/MIME ensure the confidentiality and integrity of emails? **06**

OR

How does SSL ensure secure communication over the internet?

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SHRI VAISHNAV VIDYAPEETH VISHWAVIDYALAYA, INDORE
Shri Vaishnav Institute of Information Technology
Department of CSE/ AI & DS/ IS&CC

MST -I

BTICS503M — **Network Security & Cryptography** — **Semester: V**

Time: 1 Hour — **Total Marks: 20**

Note: All questions are compulsory. Assume suitable missing data

Question No.		Marks	Related CO
1.	(a) What is network security? Why is it important?	3	CO1
	(b) What is the need for strong authentication?	3	CO5
	(c) Explain Different types of Threats in networks.	4	CO1
	OR		
	(d) What are the different types of attacks on computer network?	4	CO1
2.	(a) What is cryptography in network security?	3	CO2
	(b) What is a Caesar Cipher? Explain with Example.	3	CO2
	(c) Differentiate Between Symmetric & Asymmetric key Cryptography?	4	CO3
	OR		
	(d) What are the common password cracking techniques used by attackers?	4	CO2

CO1	Understand Need of Security in and Type of threats.
CO2	Understand Security mechanism and basic and Advance Ciphers.
CO3	Understand Advance encryption Techniques.
CO4	Understand the Key exchange protocols used in Public Key Cryptography.
CO5	Understand the Authentication and Steganography concept.

SHRI VAISHNAV VIDYAPEETH VISHWAVIDYALAYA, INDORE

Shri Vaishnav Institute of Information Technology

Department of Computer Science and Engineering

MST II

Subject Code: BTCS503M **Semester: V**

Section: CS– F, G **Total Marks**: 20

Time: 1 Hour

Subject Name: Network Security and Cryptography

Note: All questions are compulsory. Assume suitable missing data. Answer should be precise.

Question No.		Marks Related	CO
1			CO3
	a) Write down the working steps of message digest (MD5)	3	
	b) Explain AES Algorithm. How AES is provide better security from DES algorithm?	3	CO5
	c) Using RSA System find out the original message if encrypted value of original message is 6 and sender and receiver agree on some random prime number 13 and 5 and receiver broadcast his public key i.e. 7 to all the parties.	4	CO4
	OR		
	d) Consider two users, Akash and Brijesh, agree to use a prime number 13 and they Choose their privet keys 6 and 7 respectively. Find out shared secrete key which they are exchange.	4	CO5
2			
	a) What is Block Cipher? Discuss Cipher Feedback Mode with Schematic diagram.	3	CO2
	b) How is the 48-bit round sub-key generated from the 64-bit effective key from each round? Describe the key schedule process, including circular shift in DES?	3	CO4
	c) In an RSA cryptosystem, a participant uses two prime numbers 3 and 11 to generate his public and private keys. If the private key is 7, then how will the text "**JEEP**" be encrypted using the public key?	4	CO4
	OR		
	d) Discuss about the concept of key exchange using Diffie Hellman Algorithm with example.	4	CO5

CO2	Understand Security mechanism and basic and Advance Ciphers.
CO3	Understand Advance encryption Techniques.
CO4	Understand the Key exchange protocols used in Public Key Cryptography