

20.12.2022(E)

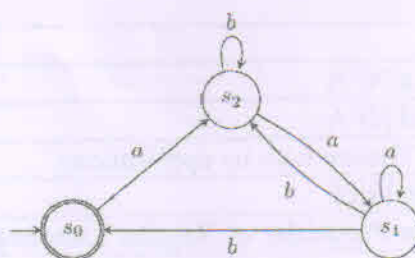

SOMAIYA
 VIDYAVIHAR UNIVERSITY

Semester: August 2022 – December 2022		
Maximum Marks: 100	Examination: ESE Examination	Duration:3 Hrs.
Programme code: 04	Class: TY	Semester: V(SVU 2020)
Programme: BTech IT		
Name of the Constituent College:	Name of the department: IT	
K. J. Somaiya College of Engineering		
Course Code: 116U04C501	Name of the Course: Theory of Computation	
Instructions: 1)Draw neat diagrams 2) All questions are compulsory		
3) Assume suitable data wherever necessary		

Que. No.	Question	Max. Marks
Q1	Solve any Four	20
i)	Explain Formal Definition of ϵ -NFA	5
ii)	Differentiate between DFA and NFA	5
iii)	Explain concept of Automata Theory with its applications	5
iv)	Explain Chomsky Hierarchy in brief	5
v)	What is regular Language? List Properties of Regular Language.	5
vi)	Write statements for Pumping Lemma for RL and CFL	5

Que. No.	Question	Max. Marks
Q2 A	Solve the following	10
i)	Give state diagram for a DFA over $\Sigma = (a, b, c)$ accepting the strings not containing "ab" followed by "cb".	5
ii)	Give state diagram for a DFA over $\Sigma = (0, 1, 2)$ accepting the strings containing every "0" followed by "1" and every "2" followed by "1"	5
	OR	
Q2 A	Design a NFA over $\Sigma = (0, 1, 2)$ accepting strings starting and ending with same symbol. Convert the same into equivalent DFA.	10
Q 2 B	Solve any One	10
i)	Minimize the DFA using Table Filling Method only with brief explanation	10
ii)	Minimize the DFA using Table Filling Method only with brief explanation	10

Que. No.	Question	Max. Marks
Q3	Solve any Two	20
i)	Derive equivalent DFA for the given Regular Expression along with its Formal Definition. $((A * B \mid A C) D)$	10
ii)	Derive equivalent DFA for the given Regular Expression along with its Formal Definition $(+ - \epsilon) [0 1 \dots 9] (+ -) \mid [0 1 \dots 9]$	10
iii)	State and prove Arden's Theorem. Derive equivalent RE for the given DFA with method using Arden's Lemma	10



Que. No.	Question	Max. Marks
Q4	Solve any Two	20
i)	Convert to GNF $S \rightarrow AS \mid BABC$ $A \rightarrow A1 \mid 0A1 \mid 01 \mid \epsilon$ $B \rightarrow 0B \mid 0 \mid \epsilon$ $C \rightarrow 1C \mid 1 \mid \epsilon$	10
ii)	Convert to GNF $S \rightarrow 0A0 \mid 1B1 \mid BB$ $A \rightarrow C$ $B \rightarrow S \mid A$ $C \rightarrow S \mid \epsilon$	10
iii)	Convert to GNF $S \rightarrow SS \mid \{S\} \mid \{\}$	10

Que. No.	Question	Max. Marks
Q5	(Write notes / Short question type) on any four	20
i)	Universal Turing Machine	5
ii)	Undecidable Problems About Turing Machine	5
iii)	Post's Correspondence Problem	5
iv)	P and NP Classes	5
v)	Decidability	5
vi)	Halting Problem	5

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Semester: August 2022 – December 2022		
Maximum Marks: 100	Examination: ESE Examination	Duration:3 Hrs.
Programme code: 04	Class: TYIT	Semester: V (SVU 2020)
Programme: B. Tech Information Technology		
Name of the Constituent College: K. J. Somaiya College of Engineering		Name of the department: Information Technology
Course Code: 116U04C502	Name of the Course: Operating Systems	
Instructions: 1)Draw neat diagrams 2) All questions are compulsory 3) Assume suitable data wherever necessary		

Que. No.	Question	Max. Marks
Q1	Solve any Four . Differentiate between:	20
i)	Mono-lithic Vs Micro-lithic kernel	5
ii)	Semaphore Vs Mutex	5
iii)	Long term, medium term and short term schedulers	5
iv)	Paging and segmentation	5
v)	Page table and inverted page table	5
vi)	L1, L2 and L3 cache memory	5

Que. No.	Question	Max. Marks
Q2 A	Solve the following for the following data: The following page sequence is given: 2 3 4 2 1 3 7 5 4 3 1 2 3 1 2 3 Assume page frame size as 3. Calculate hit ratio and fault ratio.	10
i)	LRU	5
ii)	Optimal	5
OR		
Q2 A	Work Queue: 23, 89, 32, 42, 12, 45 there are 100 cylinders numbered from 0 - 99 the disk head starts at number 99 Solve for : i) SSTF ii) LOOK And calculate seek time. Justify which algorithm is best among the two for the given sequence.	10
Q2 B	Solve any One	10
i)	Given as Main Memory Size: 4GB Cache size: 1 MB Block Size: 4 KB Word size = 1 Byte Calculate in Cache direct mapping technique: a. Physical address b. Block Number bits and block offset c. No of lines in cache d. No of Tag bits in cache	10

ii)	Given: Main Memory Size: 16 GB Block Size: 16 KB Word size=1 Byte Calculate in fully associative cache mapping technique: a. Physical address b. No of Blocks and block offset in main memory c. No of lines in cache d. No of Tag bits in cache	10
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Que. No.	Question	Max. Marks
		20
Q3	Solve any Two	10
i)	Explain fixed and dynamic partitioning with advantages and disadvantages of each.	10
ii)	Explain virtual memory combined with paging and segmentation in detail.	10
iii)	Explain placement strategies in memory management with example.	10

Que. No.	Question	Max. Marks
		20
Q4	Solve any Two	10
i)	Explain in detail cache address mapping techniques.	10
ii)	Explain in detail secondary storage management techniques.	10
iii)	Explain in detail I/O buffering techniques.	10

Que. No.	Question	Max. Marks
		20
Q5	Solve any four	5
i)	Identify issues in concurrency.	5
ii)	What are principles of concurrency?	5
iii)	Explain RTOS algorithms with suitable example.	5
iv)	Discuss hardware approaches to mutual exclusion.	5
v)	Discuss classical problems of synchronization in brief without code.	5
vi)	Discuss PCB in detail.	5



Semester: August 2022 – December 2022		
Maximum Marks: 100	Examination: ESE Examination	Duration: 3 Hrs.
Programme code: 04	Class: TY	Semester: V (SVU 2020)
Programme: B.Tech in Information Technology		
Name of the Constituent College: K. J. Somaiya College of Engineering		Name of the department: Information Technology
Course Code: 116U04E511	Name of the Course: Artificial Intelligence	
Instructions: 1) Draw neat diagrams 2) All questions are compulsory 3) Assume suitable data wherever necessary		

Que. No.	Question	Max. Marks
Q1	Solve any Four	20
i)	Categorize the environment of AI agent for Snakes and Ladders game (AI agent playing with human) into following environment types (Justification not required) a. Observable/partially Observable/Unobservable b. Single/Multi-agent c. Deterministic/Stochastic d. Episodic/Sequential e. Static/Dynamic	5
ii)	Explain an Utility Based Agent with diagram	5
iii)	State the steps of Uniform Cost search algorithm	5
iv)	Discuss the advantages of first-order logic over the propositional logic	5
v)	List the differences between forward chaining and backward chaining approach in regards to inferencing in First order Logic (any 5 points)	5
vi)	What is the confusion matrix in respect to how better the machine has learnt from the training data for classification problems? What is the size of this matrix?	5

Que. No.	Question	Max. Marks
Q2 A	Attempt the following	10
i)	For Depth-limited search, explain the terminating conditions and list any two dis-advantages of this algorithm.	5
ii)	Give the performance measure (Time complexity, Space complexity, Completeness and Optimality) of Iterative Deepening algorithm.	5
	OR	
Q2 A	What kind of evaluation function is used in informed search algorithms? What is a heuristic function? Explain the properties that a chosen heuristics function must satisfy in case of informed search algorithms.	10
Q 2 B	Solve any One	10
i)	Refer the tic-tac toe game intermediate state given below. AI agent is the one who marks X and the human player marks O . The AI player has next turn to play. Assume if O wins you should return -10, if X wins you should return +10 and will be 0 if it's a draw. Complete the state space tree from the given state below. Apply min-max Algorithm to compute the solution by indicating the back propagated values at each and every step clearly. Identify which step is to be taken further by the AI agent on its turn after the state indicated below, for increasing its winning chances.	10

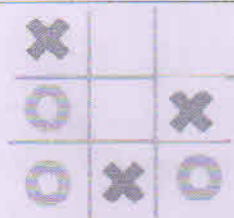


Fig: Intermediate state of tic-tac-toe

- ii) Explain how Map colouring problem (no two adjacent regions should have same colour) is solved using Constraint Satisfaction Problem approach. Consider the following map of Australia given below and the available colours as red, green and blue.

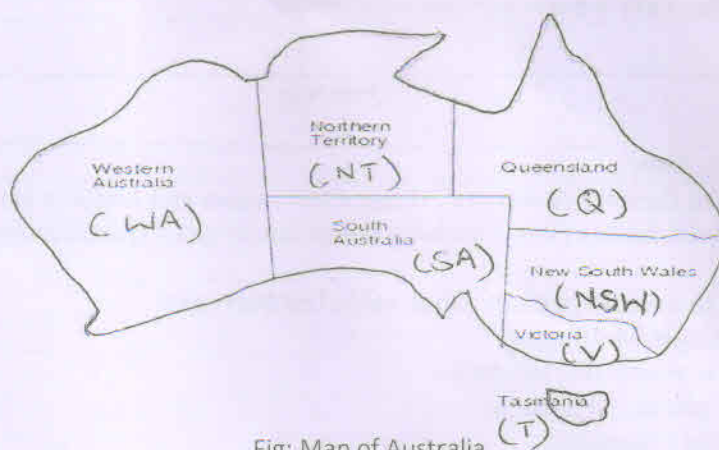


Fig: Map of Australia

Que. No.	Question	Max. Marks
Q3	Solve any Two	20
i)	Give the PEAS Description of Wumpus World Environment. How Wumpus World problem can be represented in terms of logic?	10
ii)	What is Conjunctive Normal Form (CNF)? What are the steps to convert a logic statement into CNF form? Explain inferencing using resolution refutation method in propositional logic using an example.	10
iii)	Represent the following sentences in first-order logic: <ul style="list-style-type: none"> i. None of the families are perfect ii. Everyone who studies at Somaiya Vidyavihar is smart iii. Not all non-vegetarians like both red meat and sea food iv. Some vegetable that is green is not always spinach, whereas the spinach is always green v. A Grandparent is a Parent of one's Parents 	10

Que. No.	Question	Max. Marks
Q4	Attempt any Two	20
i)	Compare Supervised learning and unsupervised learning. Give one specific example/application/problem/scenario where you will use unsupervised learning and not the supervised learning. Justify your answer.	10
ii)	What is reinforcement learning? Justify the relevance of Markov Decision Process (MDP) in the reinforcement learning.	10
iii)	What is decision tree induction algorithm (ID3)? What according to you are benefits of using decision tree for solving a classification problem?	10

Que. No.	Question	Max. Marks									
Q5	Attempt any four	20									
i)	List different Sources of uncertainty.	5									
ii)	Explain Structure of Bayesian networks	5									
iii)	What is Conditional Independence? Give one example	5									
iv)	Illustrate the use Bayes' Rule	5									
v)	Give one specific application where the Bayesian networks are used	5									
vi)	The Probability distribution for P(Cavity, Toothache) is given below: <table border="1" data-bbox="430 862 1003 981"> <tr> <td></td><td>Toothache</td><td>\sim Toothache</td></tr> <tr> <td>Cavity</td><td>0.04</td><td>0.06</td></tr> <tr> <td>\sim Cavity</td><td>0.01</td><td>0.89</td></tr> </table> <p>Obtain $P(\sim \text{Toothache})$, $P(\text{cavity} \sim \text{toothache})$ using formulae only</p>		Toothache	\sim Toothache	Cavity	0.04	0.06	\sim Cavity	0.01	0.89	5
	Toothache	\sim Toothache									
Cavity	0.04	0.06									
\sim Cavity	0.01	0.89									

24-12-2022(E)


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Semester: August 2022 – December 2022		
Maximum Marks: 100	Examination: ESE Examination	Duration: 3Hrs
Programme code: Programme: B Tech Information Technology	Class: TY	Semester: V (SVU 2020)
Name of the Constituent College: K. J. Somaiya College of Engineering	Name of the department: IT	
Course Code: 116U04E514	Name of the Course: UI Programming (DE-I)	
Instructions: 1)Draw neat diagrams 2)Assume suitable data if necessary		

Question No.		Max. Marks
Q1 (a)	Discuss methods to collect requirements from users.	10
Q1 (b)	List Common usability problems and discuss with examples any three common usability problems.	10
Q2 (a)	Discuss Drag and Drop principle with respect to a. Events b. Actors c. Approach to targeting drop of the dragged object d. Example	10
Q2 (b)	Discuss with the example of different types of Inlays. OR Discuss with the example of different types of Overlays.	10 10
Q3 (a)	Discuss with the example of different types of form patterns (Any Two) OR MyHealthTeams creates social networks for communities of people facing chronic conditions (everything from Lupus and multiple sclerosis to autism, breast cancer, and COPD). MyHealthTeams believes that when people facing the same chronic condition can connect with and learn from each other, ask questions, get referrals, and share tips with others who personally understand what it is like to face that condition, and health outcomes improve. Design two form patterns appropriate for connecting users of MyHealthTeams.	10 10
Q3 (b)	Discuss the example of two types of patterns for social content production.	10

Q4 (a)	Discuss Patterns for Screen, Light, and Sensor to design mobile UI.	10
	OR	
	Discuss Patterns for Labels and Indicators to design mobile UI	10
Q4 (b)	Create BookingPro - an event booking mobile application that lets users book several events like concerts, movies, workshops, gaming events, theatre acts, stand-up comedy shows, etc.	10
	<p>The BookingPro will facilitate the following functions:</p> <ol style="list-style-type: none"> 1. Users can sign up and then sign in to their accounts. 2. Users will be able to search for events. 3. Users will be able to book events that are near their location. 4. While booking, users can check the available seats. 5. On selecting multiple seats, the cost will keep increasing in the booking cart. 6. Users can view their previously booked events. <p>BookingPro earns its revenue from advertising as well.</p> <p>Design mobile UI screens indicating patterns for Labels and Indicators. (Minimum 3 Patterns required)</p>	
Q5 (a)	<p>UseText is an intelligent AI-driven product that helps businesses automate capturing and analyzing of structured and unstructured text data. UseText can perform the following functions:</p> <ol style="list-style-type: none"> 1. With the help of ML-enabled text extraction tools, invoices can be converted into structured data. 2. The user uploads scanned documents for categorization. The model categorizes the input images, PDF files, or scanned documents as forms, emails, memos, resumes, etc., depending on the category. 3. The text summarization module offers the unique capability of bringing the gist/synthesis of a text to the user's attention. 4. A Text Redaction module can protect confidential information so that sensitive data cannot be seen in its content. <p>Design UI with the following patterns addressing the navigational models</p> <ol style="list-style-type: none"> a. Menu Page b. Annotated <i>Scrollbar</i> c. Breadcrumb 	10
Q5 (b)	Discuss with the example of different types of static Invitation.	10
	OR	
	Illustrate a minimum of two anti-patterns for the Detailed overlay.	10

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Semester: August 2022 – December 2022		
Maximum Marks: 100	Examination: ESE Examination	Duration:3 Hrs.
Programme code: 04 Programme: B.Tech.	Class: TY	Semester: V (SVU 2020)
Name of the Constituent College: K. J. Somaiya College of Engineering	Name of the department: IT	
Course Code: 116U04C503	Name of the Course: Information and Network Security	
Instructions: 1)Draw neat diagrams 2) All questions are compulsory 3) Assume suitable data wherever necessary		

Que. No.	Question	Max. Marks
Q1	Solve any Four	20
i)	What is masquerade? Explain in brief with an example. Which principle of security is breached because of that?	5
ii)	Are message digest and digital signature the same? Why?	5
iii)	What are the advantages and disadvantages of using timestamps in an authentication protocol?	5
iv)	What is a race condition? Discuss one example of race condition.	5
v)	What is the difference between session hijacking and an IP spoofing?	5
vi)	Why is it a bad idea to use the same RSA key pair for both signing and encryption?	5

Que. No.	Question	Max. Marks
Q2 A	Solve the following	10
i)	Explain transposition cipher with an example.	5
ii)	Alice can use only additive cipher on her computer to send a message to a friend. She thinks that the message is more secure if she encrypts the message two times, each time with a different key. Is she right? Defend your answer.	5
OR		
Q2 A	Consider a plain text alphabet G. Using the RSA algorithm and the values as $E=3$, $D=11$ and $N=15$, find out what this plain text alphabet encrypts to, and verify that same letter is obtained after decryption. <i>Also explain RSA key generation Algorithm.</i>	10
Q2 B	Solve any One	10
i)	Encrypt the message "this is an exercise" using one of the following ciphers. Ignore the space between words. Decrypt the message to get the original plaintext. (a) Additive cipher with key = 15 (b) Affine cipher with key = (15,20)	10
ii)	What is SHA-1? Explain different steps of working of SHA-1.	10

Que. No.	Question	Max. Marks
Q3	Solve any Two	20
i)	How does Kerberos work? Explain with example.	10
ii)	What is MAC and DAC in access control? Elaborate with the help of an example.	10
iii)	What is biometric authentication? What are the two parameters defined for biometric measurement?	10

Que. No.	Question	Max. Marks
Q4	Solve any Two	20
i)	Why is Secure Socket Layer needed? Explain how SSL works? What are the different features provided by SSL?	10
ii)	What is Malware? Explain Salami and Linearization attacks.	10
iii)	Describe different types of IDS along with their limitations.	10

Que. No.	Question	Max. Marks
Q5	Write short notes on any four	20
i)	CAPTCHA.	5
ii)	Covert channel.	5
iii)	Access control matrix	5
iv)	IPSec	5
v)	Honeypot	5
vi)	DDos	5