Register Number | 3 | 1 | 9 | 2 | 2 | 1 | 5 | 0 | 0 | 1 | 0 | 6 | 6 |

Sri Sivasubramaniya Nadar College of Engineering, Kalavakkam – 603 110

(An Autonomous Institution, Affiliated to Anna University, Chennai)

Department of CSE

Continuous Assessment Test – I

Regulations – R2021

Degree & Branch	B. E. Computer Science and Engineering				**Semester**	VI
Subject Code & Name	**UCS 1601 – Internet Programming**					
Academic Year	2023-2024 EVEN	**Batch**	2022-2026	**Date**	**13.03.2024**	**FN**
Time: 08:15 - 09:45 a.m (90 Minutes)	**Answer All Questions**				**Maximum: 50 Marks**	

(K1: Remembering, K2: Understanding, K3: Applying, K4: Analyzing, K5: Evaluating)

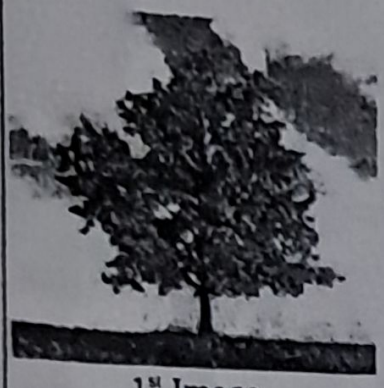
CO1:	Make use of HTML5 and CSS3 to design modern web site (K3)
CO2:	Utilize Javascript and DOM to implement dynamic web page (K3)
CO3:	Develop responsive web applications using Servlets and AJAX (K3)
CO4:	Build web application using ReactJS framework (K3)
CO5:	Develop web application using NodeJS framework (K3)

Part – A (4 × 2 = 8 Marks)

		KL	CO	PI
1.	Develop HTML code to create links to different sections within the same web page	K3	CO1	2.1.2 2.3.1
2.	Write a program by making use of CSS selectors to print the following output. I AM STYLED USING ELEMENT SELECTOR *I AM STYLED USING ID SELECTOR* I AM STYLED USING CLASS SELECTOR I am styled using universal selector	K3	CO1	2.1.2 2.3.1
3.	Identify Java Servlet statements required to retrieve the input from the user and display in response.	K3	CO3	2.1.2 2.3.1
4.	Identify the configuration files of web application and explain them briefly	K3	CO3	2.1.2 2.3.1

Part – B (3×6 = 18 Marks)

		KL	CO	PI
5.	Explain in detail the different types of style sheets with the examples of changing the style of paragraph with three different style rule declarations.	K2	CO1	1.4.1
6.	Explain in detail how *Hello Servlet* can be deployed and executed in Apache Tomcat Server.	K2	CO3	1.4.1 2.1.2

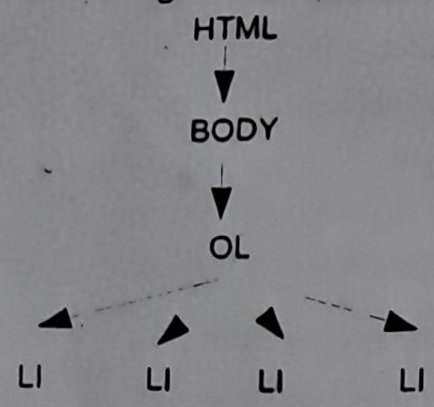
7.	Develop a JavaScript code to change the *src* of 1st image by 2nd image when mouse is kept over it. The 3rd image has to be placed when the mouse is kept out.  1st Image  2nd Image  3rd Image	K3	CO2	2.1.2 2.3.1

Part – C (2 × 12 = 24 Marks)
(Any subdivisions should be either 7+5 or 8+4)

		KL	CO	PI
8.	Explain in detail the structure of HTTP Request and HTTP Response.	K2	CO1	2.1.2 1.4.1
	(Or)			
9.	Explain in detail the process of CSS rule cascading with the following assumption. Assume that the author, user and user agent style sheets for an HTML document are as follows: Author div {color: blue} p {color:green; font-size:smaller !important} .hmm {color: red} User p {color: white; background-color:black; font-size:larger !important} body {color:yellow} User Agent body {color:black}	K2	CO1	2.1.2 1.4.1
10.	Develop a program in JavaScript to simulate Rock Paper Scissors (RPS) game. Each cell in the table shows the scores for the players to be updated in each play. For example: (0,1) indicates, 0 and 1 will be added to the total score of the players 1 and 2 respectively. Display the winning player after 10 rounds of play. **Rock** (0,0) (0,1) (1,0) **Paper** (1,0) (0,0) (1,0) **Scissors** (0,1) (1,0) (0,0)	K3	CO2	2.1.2 2.3.1 13.3.1
	(Or)			
11.	Develop JavaScript code to do the following: a. Insert a paragraph element as a right sibling of OL element. b. Add a LI element as a second child of OL	K3	CO2	2.1.2 2.3.1 13.3.1

c. Change the background color of the third LI element
d. Change the content of element of third LI element

By considering the following structure of HTML document.



Register Number | 3 | 1 | 2 | 2 | 2 | 1 | 5 | 0 | 0 | 1 | 0 | 6 | 6 |

Sri Sivasubramaniya Nadar College of Engineering, Kalavakkam – 603 110

(An Autonomous Institution, Affiliated to Anna University, Chennai)

Department of CSE

Continuous Assessment Test – II

Regulations – R2021

Degree & Branch	B. E. Computer Science and Engineering				**Semester**	VI
Subject Code & Name	**UCS 1601 – Internet Programming**					
Academic Year	2023-2024 EVEN	**Batch**	2021-2025	**Date**	**23.04.2024**	**FN**
Time: 08:15 - 09:45 a.m (90 Minutes)	**Answer All Questions**				**Maximum: 50 Marks**	

(K1: Remembering, K2: Understanding, K3: Applying, K4: Analyzing, K5: Evaluating)

CO1:	Make use of HTML5 and CSS3 to design modern web site (K3)
CO2:	Utilize Javascript and DOM to implement dynamic web page (K3)
CO3:	Develop responsive web applications using Servlets and AJAX (K3)
CO4:	Build web application using ReactJS framework (K3)
CO5:	Develop web application using NodeJS framework (K3)

Part – A (4 × 2 = 8 Marks)

		KL	CO	PI
1.	Explain when to use *async/await* function.	K2	CO5	1.4.1 2.1.2
2.	Why *session tracking* is required for the development of web application?	K1	CO3	1.4.1 2.1.2
3.	What are the important methods of XMLHttpRequest?	K1	CO3	1.4.1 2.1.2

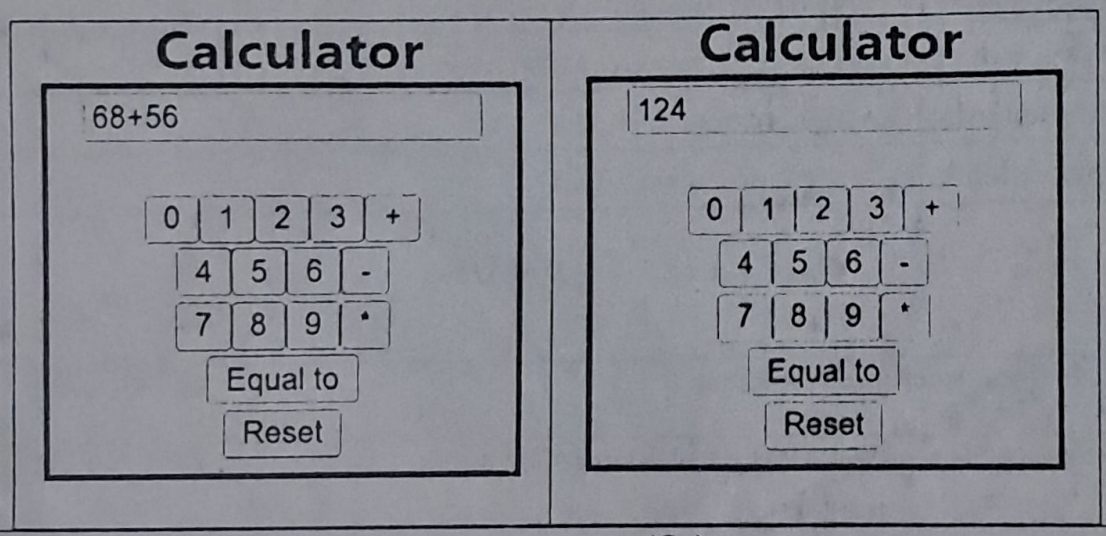
4.	Identify and briefly explain the output of the following functional component:
	`function App() {`
	`const [show, setShow] = React.useState(true);`
	`return (`
	`<>`
	`<button onClick={() => setShow(!show)}> {show ? "Hide Element Below" : "Show Element Below"} </button>`
	`{show && <div>Toggle Challenge</div>}`
	`</>`
	`);`
	`}`
		K3	CO4	1.4.1
				2.1.2

Part – B (3×6 = 18 Marks)

		KL	CO	PI
5.	Explain the concept of *useState* hook in ReactJS with a suitable example.	K2	CO4	1.4.1 2.1.2
6.	Explain session tracking using cookies with a suitable example.	K2	CO3	1.4.1 2.1.2
7.	Explain the architecture of Model View Controller, with its end-to-end flow of request and response by considering a simple example.	K2	CO5	1.4.1 2.1.2

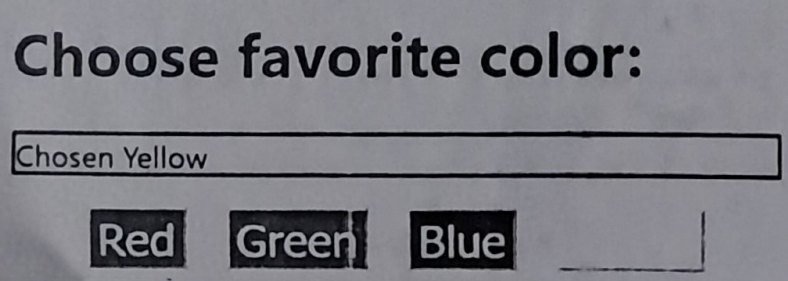
Part – C (2 × 12 = 24 Marks)
(Any subdivisions should be either 7+5 or 8+4)

		KL	CO	PI
8.	Develop a functional component ***Calculator*** to perform basic arithmetic operations. Use a state variable of type *string* which can help in concatenating the values given by the user. For example, when the user clicks the buttons 1 and 2, the concatenated value 12 is displayed in the text box. Use the function *eval()* that takes an expression as an input, evaluates it and provides the result.	K3	CO4	2.1.2 13.3.1



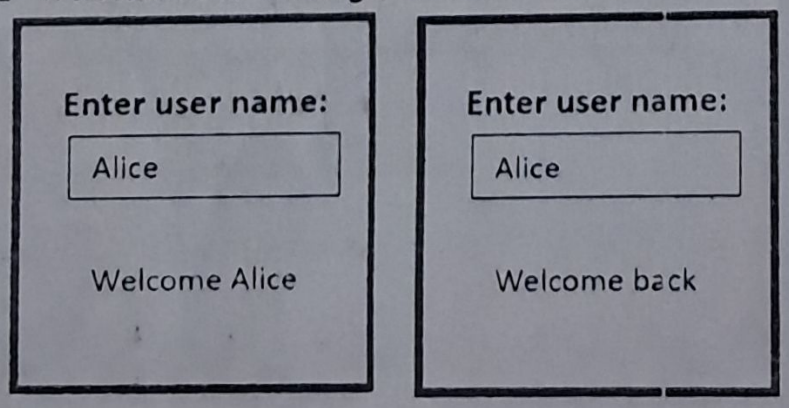
(Or)

9.	Develop a functional component ***Color Palette*** to change the background color of the text box based on the chosen color. Use a state variable of type *string* to keep track the value of the chosen color. If there are 'n' colors in the color palette, there will be "n" actions. Use refactoring method to write the actions with the help of *useReducer Hook*.	K3	CO4	2.1.2 13.3.1



10	Develop a ***Personal Profile*** full stack web application, to display the personal profile given a name of the person. Assume that the database contains the information of the persons, such as their name, address, contact details, and email. The application should possess the code for the following: • Sending a GET http request from front end, to the endpoint in the node server. • Retrieving the required information from the database at the endpoint • Displaying the information in the front end as follows: 	K3	CO5	2.1.2 13.3.1

(Or)

11.	Develop a ***VerifyUser*** full stack web application, to check whether the given user exists. Assume that the database contains the information of the users, such as their name, address, contact details, and email. The application should possess the code for the following: • Sending a GET http request from front end, to the endpoint in the node server • Retrieving the required information from the database and check whether the user exists or not at the endpoint • Displaying the message "Welcome Alice" if the user does not exist and "Welcome back" message, if the user exists 	K3	CO5	2.1.2 13.3.1

Register No: 3122215001066

Sri Sivasubramaniya Nadar College of Engineering, Kalavakkam – 603 110.

(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. / B.Tech. End Semester Theory Examinations, April / May 2024.

Sixth Semester

Computer Science and Engineering

UCS2601 INTERNET PROGRAMMING

(Regulations 2021)

Time: **Three Hours** Maximum:**100 Marks**

K1: Remembering K2: Understanding K3: Applying K4:Analyzing K5: Evaluating

CO1:	Make use of HTML5 and CSS3 to design modern web site (K3)
CO2:	Utilize Javascript and DOM to implement dynamic web page (K3)
CO3:	Develop responsive web applications using Servlets and AJAX (K3)
CO4:	Build web application using ReactJS framework (K3)
CO5:	Develop web application using NodeJS framework (K3)

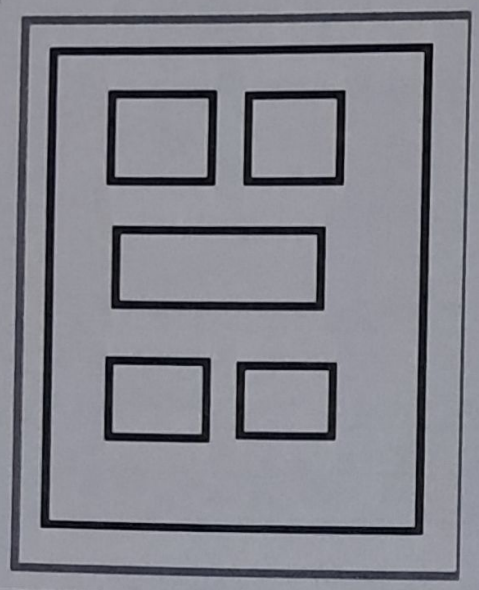
Part – A (5× 2 = 10Marks)

		KL	CO	PI
1.	What are the Semantic Elements in HTML5?	K1	CO1	1.4.1
2.	What is a JSON Object?	K1	CO2	1.4.1
3.	What is a Cookie? Give its uses.	K1	CO3	1.4.1
4.	What are the features of ReactJS.	K1	CO4	1.4.1
5.	Define Model View Controller.	K1	CO5	1.4.1

Part – B (5×6 = 30 Marks)

		KL	CO	PI
6.	Give the structure of HTTP request and response messages.	K2	CO1	1.4.1
7.	Show in detail about JavaScript variables and data types.	K2	CO2	1.4.1 2.1.2
8.	Explain cookies and methods with an example	K2	CO3	1.4.1 2.2.3
9.	What are the rules to follow with hooks and explain it?	K2	CO4	1.4.1 2.1.2
10.	Write a short note on Global Objects.	K2	CO5	1.4.1 2.2.3

Part – C (5 × 12 = 60 Marks)

		KL	CO	PI
11.	Develop the following snapshot with the help of positioning of elements and CSS box model. Explain in detail how CSS Box model and various positioning of elements are used in this development. 	K3	CO1	2.1.2 2.2.3 13.3.1
	(Or)			
12.	Develop an ***interactive web page creation***for student registration using HTML form elements. Display the contents of all the form elements when the form is submitted.	K3	CO1 CO1	2.1.2 2.2.3 13.3.1
13.	Develop a ***Calculator*** using JavaScript with basic operations such as +, -, * and %. The calculator palette has a text box to get the input and Buttons for every digit from 0 to 9. When the numbers 1, 2 and 3 are clicked it will be considered as 123. User enters the required number1 followed by an operator, number2 and an equal to operator to display the output.	K3	CO2	1.4.1
	(Or)			

14.	Initially, the website has a button with the content "Click to Collapse" and an ordered list of elements. Develop a ***modifyDocument*** program using DOM methods with the following: • When the button "Click to Collapse" is clicked, the ordered list will disappear and the content of the button will be changed to "Click to Expand" • When the button with "Click to Expand" is clicked, ordered list will appear again and the content of the button will be changed to "Click to Collapse"	K3	CO2	1.4.1
15.	Explain in detail about the architecture of servlet and its life cycle.	K2	CO3	1.4.1
	(Or)			
16.	Explain the AJAX Client Server architecture in detail with a diagram.	K2	CO3	1.4.1
17.	Develop ***Employee App using ReactJS*** to store the employee information such as Employee number, Employee name, Basic pay, HRA, DA, PF. Calculate the Gross pay, Net pay and Deductions. Implement the functionalities such as *addEmployee, updateEmployee, deleteEmployee and displayEmployee* with help of *useState* hook.	K3	CO4	2.1.2 2.2.3 13.3.1
	(Or)			
18.	Develop ***Resume App using ReactJS*** to store and manage various information such as About Me, Qualification, Experience, Personal Information with the help of routing concepts. Implement the functionalities such as adding and updating various information with the help of *useEffect* hook.	K3	CO4	2.1.2 2.2.3 13.3.1

19.	Develop a **Library management*full stack web application*** that can perform Create, Read, Update, and Delete (CRUD) operations. Assume that the database contains the information of the books, such as their name, authors, edition, and year of publication. The application should possess the code for the following: • Sending appropriate GET http requests from the front end to the endpoint on the node server. • Perform necessary operations in the Mongo Collection at the endpoints. • Create a suitable interface in ReactJS to display the results.	K3	CO5	2.1.2 2.2.3 13.3.1
	(Or)			
20.	Develop a ***Verify User application using NodeJS*** to check whether the given user exists. Assume that the database contains the information of the users, such as their name, address, contact details, and email. The application should possess the code for the following: • A module to raise named events for login and signup. Register multiple event handlers, such as printing the necessary message and updating the database. • A module to contact the database to do the necessary operations for login and signup. • A module for printing the message and a module for updating the database.	K3	CO5	2.1.2 2.2.3 13.3.1

Register Number | 3 | 1 | 2 | 2 | 2 | 1 | 5 | 0 | 0 | 1 | 0 | 6 | 6 |

Sri Sivasubramaniya Nadar College of Engineering, Kalavakkam – 603 110

(An Autonomous Institution, Affiliated to Anna University, Chennai)

Department of Computer Science and Engineering

Continuous Assessment Test – I

Regulations – R2021

Degree & Branch	B.E CSE				**Semester**	VI
Subject Code & Name	UCS2602 Software System Security					
Academic Year	2023-2024 EVEN	**Batch**	**2021-25**	**Date**	**14.03.24**	**FN / ~~AN~~**
Time: 08:10 - 09:40 a.m (90 Minutes)	**Answer All Questions**				**Maximum: 50 Marks**	

(K1: Remembering, K2: Understanding, K3: Applying, K4: Analyzing, K5: Evaluating)

CO1:	Apply the different cryptographic operations of symmetric cryptographic algorithms (K3)
CO2:	Apply the different cryptographic operations of public key cryptography (K3)
CO3:	Apply the different authentication schemes (K3)
CO4:	Outline the security mechanisms adapted in OS, Cloud and IoT (K2)
CO5:	Compare and contrast various security policies and access control mechanisms (K3)

Part – A (4 × 2 = 8 Marks)

		KL	CO	PI
1.	Why are passive attacks difficult to detect and active attacks difficult to prevent?	K1	CO1	1.4.1
2.	Explain the difference between an attack surface and an attack tree.	K2	CO1	1.4.1
3.	Inverse of a number a mod n is a number x such that $ax \equiv 1 \bmod n$. Make use of this to find the inverse of 1. 22 mod 67, 2. 23 mod 37	K3	CO2	2.1.3
4.	What is the difference between diffusion and confusion?	K2	CO2	1.4.1

Part – B (3×6 = 18 Marks)

		KL	CO	PI
5.	Discuss the properties to be satisfied for Groups, Ring and Fields	K2	CO1	1.3.1
6.	Explain the OSI security architecture	K2	CO1	1.4.1
7.	Apply Euler totient function for the following. a. $\phi(29)$ b. $\phi(51)$ c. $\phi(455)$ d. $\phi(616)$	K3	CO2	1.3.1

Part – C (2 × 12 = 24 Marks)
(Any subdivisions should be either 7+5 or 8+4)

		KL	CO	PI
8.	a. Let 9 be the multiplicative key, and let 2 be the additive key. The encryption process is given by the encryption function $9p + 2\ (mod\ 26)$. The plaintext to be encrypted is "*april*"	K3	CO1	2.4.3

Plaintext	*a*	P	R	I	L
Numerical Value	0	15	17	8	11
9P+2 mod 26	2	7	25	22	23
Ciphertext	C	H	Z	W	X

Apply the decryption process, in which the recipient must manipulate the encryption function as:

$$C \equiv 9p + 2\ mod\ 26 \Rightarrow 9P \equiv C - 2\ mod\ 26$$
$$9^{-1}9x \equiv 9^{-1}(C-2) mod\ 26$$

Apply Extended Euclid's algorithm and do the decryption. [7 Marks]

b. What are the negatives of the elliptic curve points over $\mathbb{Z}_{17}$, P= (5,8), Q= (3,0) and R= (0,6) [5 Marks]

(Or)

9.	a. Consider a Feistel cipher composed of sixteen rounds with a block length of 64 bits and a key length of 48 bits. Suppose that, for a given k, the key scheduling algorithm determines values for the first eight round keys, $k_1, k_2, k_3, k_4, k_5, k_6, k_7, k_8, k_9 = k_8, k_{10} = k_7, k_{11} = k_6, k_{12} = k_5, k_{13} = k_4, k_{14} = k_3, k_{15} = k_2, k_{16} = k_1,$ Suppose you have a ciphertext c. Explain how, with access to an encryption oracle, you can decrypt c and determine m using just a single oracle query. (7 Marks) b. Apply Miller Rabin Theorem to check whether 1723 is prime or not. [5 Marks]	K3	CO1	2.4.3
10.	a. State CRT and find x for the given set of congruences. $x \equiv 3\ mod\ 5$ $x \equiv 4\ mod\ 6$ $x \equiv 5\ mod\ 7$ [8 marks] b. Alice and Bob exchange their authentic RSA key parameters. Let n_a, c_a and n_b, c_b be the public parameters of Alice and bob respectively. Similarly let d_a and d_b be private RSA keys of Alice and Bob respectively. Let $E_k()$ and $D_k()$ be the encryption and decryption functions of the popular symmetric key cipher AES. Bob wants to send a large file FILE to Alice as explained below: 1. Choose a random key k_s and encrypts as $k_s^{c_a}\ mod\ n_a$ 2. Encrypts FILE using the AES Cipher as ENC.FILE= $E_{k_s}(FILE)$ 3. Compute h=HASH(FILE), where HASH is a public hash function 4. Compute the signature as $s = h^{d_b}\ mod\ n_b$ 5. Sends $(ENC.FILE, C, S)$ to Alice	K3	CO2	1.4.1

	Apply the steps to be performed by Alice to get the message. The message is error free and tamper proof. [4 Marks]			
	(Or)			
11.	a. Write the algorithm of RSA and apply RSA with p=11, q=13, e=11 and M=88 and show the encryption and decryption. [8 Marks] b. Briefly explain Diffie Hellman with the following example. Users A and B use the Diffie Hellman Key Exchange technique a common prime q = 23 and a primitive root α = 5. 1. If user A has a private key $X_A = 4$ what is the public key Y_A? 2. If user B has private key $X_B = 3$, and using the user A public key Y_A Compute Shared secret key $K_{AB} = Y_A^{X_B} \ mod \ q$ [4 Marks]	K3	CO2	1.4.1

Register Number | 3 | 1 | 2 | 2 | 2 | 1 | 5 | 0 | 0 | 1 | 0 | 6 | 6 |

Sri Sivasubramaniya Nadar College of Engineering, Kalavakkam – 603 110

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Department of Computer Science and Engineering

Continuous Assessment Test – II

Regulations – R2021

Degree & Branch	B.E CSE				**Semester**	VI
Subject Code & Name	UCS2602 Software System Security					
Academic Year	2023-2024 EVEN	**Batch**	**2021-25**	**Date**	**24.04.24**	**FN / ~~AN~~**
Time: 08:10 - 09:40 a.m (90 Minutes)	**Answer All Questions**				**Maximum: 50 Marks**	

(K1: Remembering, K2: Understanding, K3: Applying, K4: Analyzing, K5: Evaluating)

CO1:	Apply the different cryptographic operations of symmetric cryptographic algorithms (K3)
CO2:	Apply the different cryptographic operations of public key cryptography (K3)
CO3:	Apply the different authentication schemes (K3)
CO4:	Outline the security mechanisms adapted in OS, Cloud and IoT (K2)
CO5:	Compare and contrast various security policies and access control mechanisms (K3)

Part – A (4 × 2 = 8 Marks)

		KL	CO	PI
1.	Digital signature can be used for entity authentication. Justify or refute	K2	CO3	1.4.1
2.	What is a session key?	K2	CO3	1.3.1
3.	Bring out the differences between private cloud and public cloud.	K2	CO4	2.2.3
4.	What is Bell-Lapadula model for confidentiality policy?	K2	CO5	2.1.3

Part – B (3×6 = 18 Marks)

		KL	CO	PI
5.	For the given Key exchange Protocol given below, find whether it ensures the following. 1. Key freshness, 2. Mutual authentication, 3. Key transport or key agreement protocol 4. Is it secure? Assume the following scenario conversation is: a. Alice's Key with the KDC ($KDC - A: K_A = 3$) Bob's Key with the KDC ($KDC - B: K_B = 7$)	K3	CO3	2.4.1

	Session Key Generated by KDC: $K_S = 9$ Alice's Nonce: $N_A = 123$, Bob's Nonce: $N_B = 456$ b. Alice Initiates Communication with the KDC: (Alice, Bob, 123) c. KDC Responds with Session Key: One encrypted with Alice's key $K_A = 3$, $\{K_S, B\}_{K_A} = \{9, B\}_3 =$ 92 One encrypted with Bob's key $K_B = 7$, $\{K_S, A, N_A\}_{K_B} =$ $\{9, A, 123\}_7 = 97$ KDC sends to Alice: (92,97) d. Alice Contacts Bob: Alice decrypts 92 with K_A to get K_S and Bob's identity. Alice sends $\{K_S, A, N_A\}_{K_B} = \{9, A, 123\}_7 = 97$ to Bob. e. Bob Decrypts using K_B and verifies and gets K_S. Bob Encrypts his nonce $N_B = 456$ along with $N_A = 123$ using K_S.	K2	CO3	2.1.3
6.	What is a x.509 public-key certificate?	K2	CO4	2.2.3
7.	.Explain in detail about Elasticity in Cloud and On-demand. Provisioning	K2	CO4	2.2.3

Part – C (2 × 12 = 24 Marks)

(Any subdivisions should be either 7+5 or 8+4)

		KL	CO	PI
8.	a. Write the algorithm of RSA digital signature used for entity authentication and apply RSA digital signature scheme with p=11, q=13, e=11 and M=88 and show the sign and verification. [7 Marks] b. Briefly explain Kerberos in server based shared key establishment protocol. [5 Marks]	K3	CO3	2.4.1
	(Or)			
9.	a. Briefly explain Diffie Hellman key exchange algorithm. Illustrate with the following example. Users A and B use the Diffie Hellman Key Exchange technique a common prime q = 157 and a primitive root α = 5. 1. If user A has a private key $X_A = 15$ what is the public key Y_A? 2. If user B has private key $X_B = 27$, and using the user B public key Y_B, Compute Shared secret key K_{AB} [7 Marks] b. Explain Uni pass and mutual authentication in key exchange algorithm? [5 Marks]	K3	CO3	2.4.1

10.	a. Your task in this problem is to complete the design of an authentication system for a hotel. The hotel uses an electronic lock system to control access to rooms throughout the property. The system uses the "something you have" paradigm for authentication. We assume you are familiar with the kind of lock system typically employed in modern hotels, and essentially, we are asking you to design that kind of system. Hotel guests are issued keycards that authenticate to locks. A guest's keycard should open their room, but not other rooms. Staff are issued master keycards, which can open every lock in the hotel. The Hardware authentication involves is as follows: I. Humans are issued keycards as authentication tokens. II. Rooms have electronic locks which require insertion of a keycard to authenticate. III. The front desk has a stationary computer called an encoder that is used to configure keycards. IV. The front desk has a handheld computer called a portable programmer that is used to configure locks. [7 marks] b. What is NIST cloud computing reference architecture with different actors? [5 Marks]	K3	CO4	2.2.3
	(Or)			
11.	a. Design an authentication protocol for Automatic teller machine (ATM). The ATM will not provide service to customers unless the communication link is active. If the link ever is inactive, the ATM cancels any in-process transactions and refuses to begin any new transactions. To receive service, a customer inserts their ATM card into the reader. The ATM reads the magnetic stripe and returns the card to the customer. The customer then enters a PIN on the keypad. Apply suitable authentication mechanism to support transaction for withdrawal and deposit. b. Briefly explain SSH protocol [5 Marks]	K3	CO4	2.2.3

Register Number | 3 | 1 | 2 | 2 | 2 | 1 | 5 | 0 | 0 | 1 | 0 | 6 | 6 |

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Department of Computer Science and Engineering

Continuous Assessment Test – I

Regulations – R2021

Degree & Branch	B.E. & CSE				**Semester**	VI
Subject Code & Name	**UCS2603 THEORY OF COMPUTATION**					
Academic Year	2023-2024 EVEN	**Batch**	2021-2025	**Date**	15-03-2024	**FN**
Time: 08:10 - 09:40 a.m (90 Minutes)	**Answer All Questions**				**Maximum: 50 Marks**	

(K1: Remembering, K2: Understanding, K3: Applying, K4: Analyzing, K5: Evaluating)

CO1:	Construct mathematical proofs related to computation and finite automata for a given language (K3)
CO2:	Identify relationship between finite automata and regular expressions (K3)
CO3:	Distinguish different types of grammars, analyse relationship between language and context free grammar and construct PDA for CFG (K4)
CO4:	Construct Turing machine for a given language (K3)
CO5:	Explain the decidability or undecidability of various problems and make use of it (K3)

Part – A (4 × 2 = 8 Marks)

		KL	CO	PI
1.	Show a DFA which accepts all strings without two consecutive 1's over $\sum=\{0,1\}$.	K2	CO1	1.4.1
2.	Show the regular expression for the following: Strings of a's and b's with no consecutive a's.	K2	CO2	2.4.1
3.	What is the type of grammar given by the following set of productions? $A \rightarrow aA \mid bB$ $B \rightarrow bA \mid aB \mid \varepsilon$	K1	CO3	2.1.3
4.	Find the language generated by $S \rightarrow 0S1 \mid 0A \mid 0 \mid 1B \mid 1$ $A \rightarrow 0$ $B \rightarrow 1$	K1	CO3	2.1.3

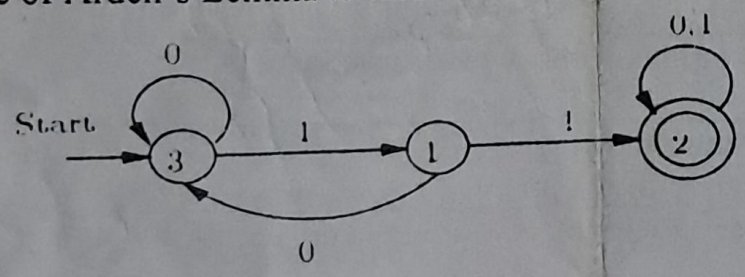
Part – B (3×6 = 18 Marks)

		KL	CO	PI
5.	If L is accepted by an NFA then show that L is also accepted by a DFA.	K2	CO1	2.1.3
6.	Construct the regular expression whose language consists of strings with alternate 0's and 1's over an alphabet $\sum=\{0,1\}$.	K2	CO2	1.4.1 2.4.1
7.	State the pumping lemma for regular languages and check whether a language $L=\{ww^r / w \in (a, b)^*\}$ is regular or not.	K2	CO2	1.4.1 2.4.1

Part – C (2 × 12 = 24 Marks)

		KL	CO	PI
8.	a. Construct a DFA for the following language L over the alphabet $\Sigma = \{0, 1\}$ (8 Marks) **L = {w | w when interpreted as a binary number is divisible by 3}** b. Check the string validity for the number 15 using the constructed DFA. Hint: Convert 15 to required format of the model (4 Marks)	K3	CO1	1.4.1 2.1.3 2.4.1 13.3.1 13.4.1
	(Or)			
9.	a. Construct a DFA equivalent to the NFA. $M = (\{p,q,r,s\}, \{0,1\}, \delta, p, \{q,s\})$ Where δ is defined in the following transition table.	K3	CO1	1.4.1 2.1.3 2.4.1 13.3.1 13.4.1

δ	0	1
p	{q,s}	{q}
q	{r}	{q,r}
r	{s}	{p}
s	-	{p}

		KL	CO	PI
10.	Construct a minimized DFA for the RE $(0^*+1^*)(0+1)^*$.	K3	CO2	1.4.1 2.1.3 2.4.1 13.3.1 13.4.1
	(Or)			
11.	Make use of Arden's Lemma to find the RE for the given DFA.  	K3	CO2	1.4.1 2.1.3 2.4.1 13.3.1 13.4.1

Register Number | 3 | 1 | 2 | 2 | 2 | 1 | 5 | 0 | 0 | 1 | 0 | 6 | 6 |

Sri Sivasubramaniya Nadar College of Engineering, Kalavakkam – 603 110

(An Autonomous Institution, Affiliated to Anna University, Chennai)

Department of Computer Science and Engineering

Continuous Assessment Test – II

Regulations – R2021

Degree & Branch	B.E. & CSE				**Semester**	VI
Subject Code & Name	**UCS2603 THEORY OF COMPUTATION**					
Academic Year	2023-2024 EVEN	**Batch**	2021-2025	**Date**	25-04-2024	**FN**
Time: 08:10 - 09:40 a.m (90 Minutes)	**Answer All Questions**				**Maximum: 50 Marks**	

(K1: Remembering, K2: Understanding, K3: Applying, K4: Analyzing, K5: Evaluating)

CO1:	Construct mathematical proofs related to computation and finite automata for a given language (K3)
CO2:	Identify relationship between finite automata and regular expressions (K3)
CO3:	Distinguish different types of grammars, analyse relationship between language and context free grammar and construct PDA for CFG (K4)
CO4:	Construct Turing machine for a given language (K3)
CO5:	Explain the decidability or undecidability of various problems and make use of it (K3)

Part – A (4 × 2 = 8 Marks)

		KL	CO	PI
1.	Define Pushdown automata.	K1	CO3	1.4.1
2.	Construct Turing machine to find 1's complement of a binary number.	K3	CO4	2.1.3
3.	Explain the Move interpretation of a Turing machine with an example.	K2	CO4	2.1.3
4.	Classify the following languages under decidable and undecidable problems. • Regular language • Recursive language • CFL • Non Recursive Enumerable language • CSL • Recursive Enumerable language	K2	CO5	2.1.3

Part – B (3×6 = 18 Marks)

		KL	CO	PI
5.	Construct a PDA for the following language. $L= \{0^n 1^{n+m} 2^m \mid m, n >= 1\}$ Show the validation of w = 011122.	K3	CO3	1.4.1 2.4.1 13.4.1
6.	Show that the given language is not a Context Free Language (CFL). $L=\{x^n y^n z^n \mid n>=1\}$	K2	CO3	1.4.1 2.4.1
7.	Explain the closure properties of Recursive(R) and Recursively Enumerable (RE) languages with appropriate examples.	K2	CO5	1.3.1 1.4.1

Part – C (2 × 12 = 24 Marks)

		KL	CO	PI
8.	Construct a Chomsky Normal Form (CNF) representation for the given Context Free Grammar. $S \rightarrow ASB \mid \varepsilon$ $A \rightarrow aAS \mid a$ $B \rightarrow SbS \mid A \mid bb$	K3	CO3	1.3.1 1.4.1 2.1.3 2.4.1 13.3.1
	(Or)			
9.	Construct a Greibach Normal Form (GNF) representation for the given Context Free Grammar. $S \rightarrow AB$ $A \rightarrow BS \mid b$ $B \rightarrow SA \mid a$	K3	CO3	1.3.1 1.4.1 2.1.3 2.4.1 13.3.1
10.	Construct a Turing Machine for the following language. $L = \{0^n 1^n 2^n \mid n >= 1\}$ Show the validation of w = 001122 and w = 0012	K3	CO4	1.3.1 1.4.1 2.1.3 2.4.1 13.3.1 13.4.1
	(Or)			
11.	Construct a Turing Machine to subtract 2 numbers. $f(m, n) = m\text{-}n$ if $m > n$ $f(m, n) = B$ if $m <= n$ Find the solution for *2-1* using the constructed Turing Machine.	K3	CO4	1.3.1 1.4.1 2.1.3 2.4.1 13.3.1 13.4.1

Register No: 3122215001066

Sri Sivasubramaniya Nadar College of Engineering, Kalavakkam – 603 110.

(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. / B.Tech. End Semester Theory Examinations, April / May 2024.

Sixth Semester

Computer Science and Engineering

UCS2603 THEORY OF COMPUTATION

(Regulations 2021)

Time: **Three Hours** Maximum:**100 Marks**

K1: Remembering K2: Understanding K3: Applying K4: Analyzing K5: Evaluating

CO1:	Construct mathematical proofs related to computation and finite automata for a given language (K3)
CO2:	Identify relationship between finite automata and regular expressions (K3)
CO3:	Distinguish different types of grammars, analyze relationship between language and context free grammar and construct PDA for CFG (K4)
CO4:	Construct Turing machine for a given language (K3)
CO5:	Explain the decidability or undecidability of various problems and make use of it (K3)

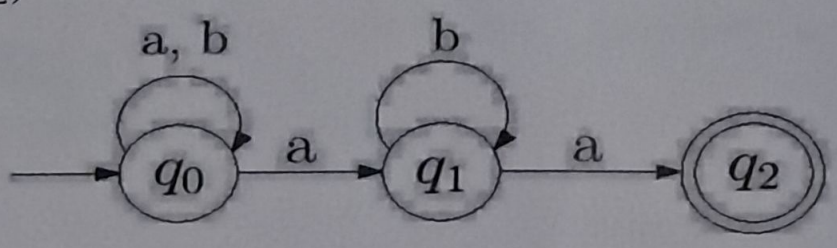
Part – A (5 × 2 = 10 Marks)

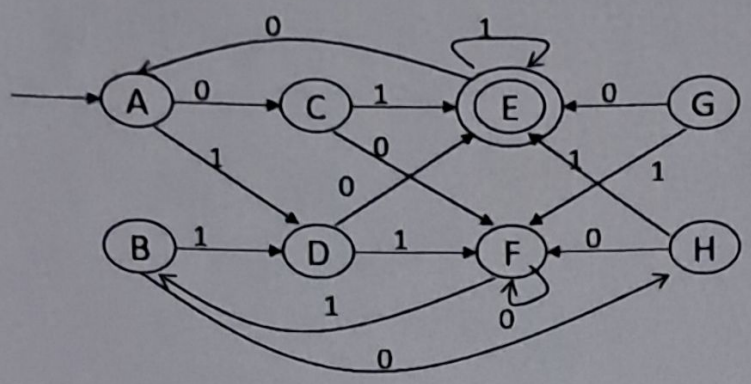
		KL	CO	PI
1.	Let A be a DFA and '**q**' a particular state of A, such that δ(q, a) = q for all input symbols '**a**'. Show by induction on the length of the input that for all input strings w, $\hat{\delta}(q, w) = q$.	K2	CO1	1.3.1
2.	Construct an NFA with ε- transitions for the given regular expression 00(0 + 1)*.	K3	CO2	1.4.1
3.	Construct context-free grammar for the following language: $\{a^i b^j c^k \mid i \neq j \text{ and } j \neq k \}$.	K3	CO3	1.4.1 2.1.3
4.	Compare Pushdown Automata and Turing Machine.	K2	CO4	1.4.1
5.	Prove that recursive languages are closed under complementation.	K2	CO5	1.4.1 2.1.3

Part – B (5 × 6 = 30 Marks)

		KL	CO	PI
6.	Construct ε-closure of each state and its equivalent NFA for the following ε-NFA. δ | ϵ | 0 | 1 $\rightarrow p$ | $\{r\}$ | $\{q\}$ | $\{p, r\}$ q | $\emptyset$ | $\{p\}$ | $\emptyset$ $*r$ | $\{p, q\}$ | $\{r\}$ | $\{p\}$	K3	CO1	2.1.3, 13.3.1
7.	State the pumping lemma for regular languages. Let Σ = {a, b}, prove the language L = {w ϵ Σ* | n_a (w) < n_b (w)} is not regular.	K3	CO2	2.1.3 2.4.1
8.	Show that every regular language is a context-free language.	K2	CO3	1.4.1
9	List and explain the modifications of Turing Machine.	K2	CO4	2.4.1
10.	Explain Post Correspondence Problem. Verify and explain whether there exists a solution for the Modified PCP given 2 lists A= {1, 111, 10, 0} and B = {11, 1, 0111, 10}.	K2	CO5	2.1.3 13.3.1

Part – C (5 × 12 = 60 Marks)

		KL	CO	PI
11.	(a) Construct a DFA that accepts the following language: L = {w ϵ (0, 1)* | w ends in 00}. **5 Marks** (b) Design a DFA to accept the language L = {w ϵ (a, b, c)* | w starts and ends with the same symbol}. **7 Marks**	K3	CO1	2.1.3 2.4.1 13.3.1
	(Or)			
12.	Convert the following Non-deterministic Finite Automata M_1 to an equivalent Deterministic Finite Automata M_2 using the subset construction procedure. Prove that L(M_1) = L(M_2). 	K3	CO1	2.1.3 2.4.1 13.3.1

13.	Write the procedure to minimize a DFA. Construct the minimized DFA for the following DFA.  	K3	CO2	1.3.1 2.1.3 2.4.1 13.3.1
	(Or)			
14.	Solve: Let $L_1 = \{w \in \{a, b\}^* \mid$ begin with a and ends with b$\}$ and $L_2 = \{x \in \{a, b\}^* \mid$ aaa is not a subword$\}$. If L_1 and L_2 are regular languages, then prove that $L_1 \cap L_2$ is regular with appropriate diagram.	K3	CO2	1.3.1 2.1.3 2.4.1 13.3.1
15.	(a) Define the Chomsky Hierarchy of Grammar (Mention rules form for each type of grammar and the restriction). **5 Marks** (b) Convert the following grammar into a reduced grammar.**7 Marks** $S \rightarrow aA \mid aBB,$ $A \rightarrow aaA \mid \varepsilon,$ $B \rightarrow bB \mid bbC,$ $C \rightarrow B$	K3	CO3	1.4.1 2.1.3 2.4.1 13.3.1
	(Or)			
16.	Convert the PDA $M = (\{q\}, \{a, b\}, \{Z, A, B\}, \delta, q, Z, \varphi)$ to an equivalent CFG, if δ is given by: $\delta(q, a, Z) = (q, AZ),$ $\delta(q, b, Z) = (q, BZ),$ $\delta(q, a, A) = (q, AA),$ $\delta(q, b, B) = (q, BB),$ $\delta(q, a, B) = (q, \varepsilon),$ $\delta(q, b, A) = (q, \varepsilon),$	K3	CO3	1.4.1 2.1.3 2.4.1 13.3.1

	$\delta(q, \varepsilon, Z) = (q, \varepsilon)$			
17.	Construct a Turing Machine to perform subtraction of 2 numbers. $f(m,n) = m-n$ *if* $m > n$ $f(m,n) = B$ *if* $m <= n$ Show the validation of w = 0010.	K3	CO4	1.4.1 2.4.1 13.3.1 13.4.1
	(Or)			
18.	Consider the two track Turing Machine M as a 7-tuple (Q, $\sum$, Γ, δ, q_0, B, F). Using M, design a two track Turing Machine for the Language L={ $0^k 1^k \mid k>=1$}.	K3	CO4	1.4.1 2.4.1 13.3.1 13.4.1
19.	Prove the following: a) If A and B are decidable, then AUB is decidable. b) If A and B are undecidable, then AUB is undecidable. c) If A and B are non recursively enumerable, then AUB is non recursively enumerable.	K3	CO5	2.1.3 2.4.1 13.3.1
	(Or)			
20.	(a) Consider the Turing machine M = ({q_0, q_1, q_2, q_3}, {0, 1}, {0, 1, B}, δ, q_0, B, {q3}) with δ consisting of the following sets of rules: $\delta(q_0, 0) = \{(q_0, 0, R)\}$, $\delta(q_0, 1) = \{(q_1, 1, R)\}$, $\delta(q_1, 1) = \{(q_2, 1, R)\}$, $\delta(q_1, 0) = \{(q_1, 0, R)\}$, $\delta(q_2, 0) = \{(q_2, 0, R)\}$, $\delta(q_2, 1) = \{(q_3, 1, R)\}$, $\delta(q_3, 0) = \{(q_3, 0, R)\}$, $\delta(q_3, 1) = \{(q_0, 1, R)\}$. Informally but clearly describe the language L(M). Construct a binary encoding for M .	K3	CO5	2.1.3 2.4.1 13.3.1

Register Number | 3 | 1 | 2 | 2 | 2 | 1 | 5 | 0 | 0 | 1 | 0 | 6 | 6 |

Sri Sivasubramaniya Nadar College of Engineering, Kalavakkam – 603 110

(An Autonomous Institution, Affiliated to Anna University, Chennai)

Computer Science and Engineering

Continuous Assessment Test – I

Regulations – R2021

Degree & Branch	BE - CSE				**Semester**	6
Subject Code & Name	**UCS2604 - PRINCIPLES OF MACHINE LEARNING**					
Academic Year	2023-2024 ~~ODD~~/EVEN	**Batch**	2021-2025	**Date**	**18.03.2024**	**FN / ~~AN~~**
Time: 08:15 - 09:45 a.m (90 Minutes)	**Answer All Questions**				**Maximum: 50 Marks**	

(K1: Remembering, K2: Understanding, K3: Applying, K4: Analyzing, K5: Evaluating)

CO1	Explain the basic concepts of machine learning (K2)
CO2	Apply supervised algorithms for different classification problems (K3)
CO3	Explain the need for ensemble methods (K2)
CO4	Apply unsupervised and reinforcement learning techniques to various problems (K3)
CO5	Apply dimensionality reduction and optimization techniques (K3)

Part – A (4 × 2 = 8 Marks)

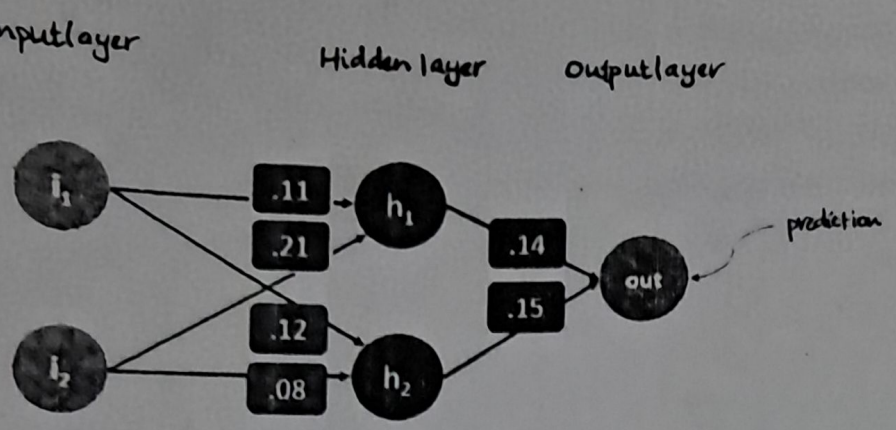
		KL	CO	PI
1.	Compare classification and regression problems with suitable examples.	K2	CO1	1.4.1
2.	Summarize Curse of Dimensionality with a suitable graph	K2	CO1	1.4.1
3.	Consider the company's performance over a five-year period. The closing price of stocks for these five years are given below. • $74.01 • $74.77 • $73.94 • $73.61 • $73.40 Apply the method of **sum of squares** and infer whether the customers could invest in the company's stocks or not.	K3	CO2	1.1.1 2.1.3
4.	Outline the need for kernel trick in Support Vector Machines.	K2	CO2	2.1.3

Part – B (3×6 = 18 Marks)

		KL	CO	PI
5.	Consider a binary classifier which classifies the corona tests of individuals as infected or non-infected. Given a dataset of 13 individuals which includes both infected and non-infected categories. The dataset has 8 infected and 5 non-infected individuals, where infected belong to class 1 and non-infected belong to class 0. The actual and predicted class labels are shown below. **Actual Class = [1,1,1,0,0,0,0,1,0,0,0,0,0]** **Predicted Class = [0,0,0,1,1,1,1,1,0,0,0,0,0]** Construct a confusion matrix and calculate precision, recall and F1 measure.	K3	CO1	1.1.1 2.1.3 13.3.1
6.	Interpret the need of bias, activation function and learning rate in training a neural network. Elaborate your answer on each parameter.	K2	CO2	1.4.1
7.	Outline the working of lazy learners. Illustrate the K-Nearest Neighbor Algorithm with necessary examples and diagrams.	K2	CO3	1.4.1 13.3.1

Part – C (2 × 12 = 24 Marks)
(Any subdivisions should be either 7+5 or 8+4)

		KL	CO	PI
8.	Consider a neural network with 2 inputs and 1 output. The output is '+1' (Plus 1) when there are even numbers of zeros or ones in the input. The output is '-1' (minus 1) when there are odd numbers of zeros or ones in the input. Model this network using a simple Perceptron Learning Algorithm and update weights when the output is misclassified. Note: Initialization values: **w0 = w1 = w2 = 0.5, Learning Rate= 0.1, bias = -1, Wtheta = 1.0.** Find the updated weight of each sample for one epoch. $W_{new} = W_{old} - \eta(y_j - t_j).\ x_i$ Where, η is learning rate, y is predicted output, t is target and x is the vector of inputs.	K3	CO2	2.4.1 13.3.1
	(Or)			
9.	Use the given data to compute the correlation coefficient and build a regression model for finding the weight of a person with the input as height of a person. Height (X): 70, 62, 65, 60, 62, 72, 68, 66 Weight (Y): 215, 180, 185, 160, 162, 220, 190, 185 If the height is 63 inches, can you predict the weight of this person using the model you built?	K3	CO2	2.4.1 13.3.1
10.	Apply Multi-Layer Perceptron algorithm for the given neural network and backpropagate the errors to reduce misclassification rate. **Consider two inputs: 2 and 3. Target output :1, weights:** **w1 = 0.11, w2 = 0.21, w3 = 0.12, w4 = 0.08, w5 = 0.14 and w6 = 0.15** **learning rate:1, Activation function: sigmoid.** Calculate the output of the model in the forward pass. Compute the residue and back	K3	CO2	2.4.1 13.3.1

	propagate the error, update the weights. Perform one forward and one backward pass. (6 +6)  			
	(Or)			
11.	Consider a binary classification problem which separates data points into classes using a straight line. The distance between the straight line and the data points should be maximized. Identify the suitable classification algorithm for this specification and model using a constrained optimization problem by applying linear algebra. (5) Derive the function for the model which tolerates and does not tolerate errors. (4) Extend the model function to cater for non-linearly separable data. (3)	K3	CO2	2.4.1 13.3.1

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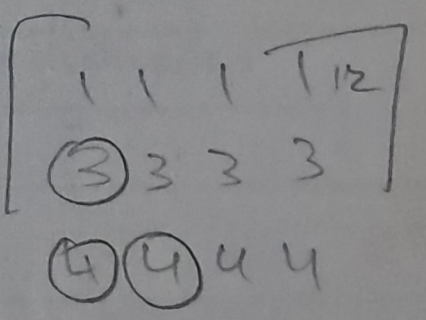

Register Number | 3 | 1 | 2 | 2 | 2 | 1 | 5 | 0 | 0 | 1 | 0 | 6 | 6 |

Sri Sivasubramaniya Nadar College of Engineering, Kalavakkam – 603 110

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Computer Science and Engineering

Continuous Assessment Test – II

Regulations – R2021

Degree & Branch	BE - CSE				**Semester**	6
Subject Code & Name	**UCS2604 - PRINCIPLES OF MACHINE LEARNING**					
Academic Year	2023-2024 ~~ODD~~/EVEN	**Batch**	2021-2025	**Date**	**26.04.2024**	FN / ~~AN~~
Time: 08:15 - 09:45 a.m (90 Minutes)	**Answer All Questions**				**Maximum: 50 Marks**	

(K1: Remembering, K2: Understanding, K3: Applying, K4: Analyzing, K5: Evaluating)

CO1	Explain the basic concepts of machine learning (K2)
CO2	Apply supervised algorithms for different classification problems (K3)
CO3	Explain the need for ensemble methods (K2)
CO4	Apply unsupervised and reinforcement learning techniques to various problems (K3)
CO5	Apply dimensionality reduction and optimization techniques (K3)

Part – A (4 × 2 = 8 Marks)

		KL	CO	PI
1.	Make use of the entropy metric and compute the impurity value for the following data: [5+, 5-], [0+, 10-], [8+, 2-] Write your inference about the purity of the data points from the calculated entropy values.	K3	CO3	1.1.1
2.	Compare Markov Decision Process with the traditional decision process in Reinforcement Learning (RL).	K2	CO4	1.4.1
3.	Make use of a suitable real-time scenario and describe the concept of unsupervised learning.	K3	CO4	1.4.1
4.	Compare Principal Component Analysis (PCA) and Linear Discriminant Analysis (LDA) in handling the "curse of dimensionality".	K2	CO5	1.4.1

Part – B (3×6 = 18 Marks)

		KL	CO	PI
5.	Consider the following dataset and apply a probabilistic model using Baye's Theorem to classify the species as 'M' or 'H'	K3	CO3	1.1.1 2.1.3 13.3.1

Sl. No.	Color	Legs	Height	Smelly	Species
1	White	3	Short	Yes	M
2	Green	2	Tall	No	M
3	Green	3	Short	Yes	M
4	White	3	Short	Yes	M
5	Green	2	Short	No	H
6	White	2	Tall	No	H
7	White	2	Tall	No	H
8	White	2	Short	Yes	H

Using the above data, identify the species of an entity with the following attributes.

X={Color=Green, Legs=2, Height=Tall, Smelly=No}

6.	Illustrate bagging and boosting techniques with suitable diagrams.	K2	CO3	1.4.1
7.	Compare Q learning with SARSA Algorithm in Reinforcement Learning.	K2	CO4	1.4.1

Part – C (2 × 12 = 24 Marks)
(Any subdivisions should be either 7+5 or 8+4)

		KL	CO	PI
8.	Consider the 4 samples each having 2 features given below. Apply PCA to transform the data into k-dimensional space. *Samples*: $\begin{pmatrix}2\\4\end{pmatrix}, \begin{pmatrix}4\\5\end{pmatrix}, \begin{pmatrix}5\\6\end{pmatrix}, \begin{pmatrix}3\\2\end{pmatrix}$	K3	CO5	1.1.1 2.1.3 2.4.1 13.3.1
	(Or)			
9.	Consider the given samples with two classes: W1 and W2. Apply LDA to transform the data into k-dimensional space. $W1$: $\begin{pmatrix}3\\5\end{pmatrix}, \begin{pmatrix}4\\3\end{pmatrix}, \begin{pmatrix}5\\6\end{pmatrix}, \begin{pmatrix}7\\5\end{pmatrix}$ $W2$: $\begin{pmatrix}9\\4\end{pmatrix}, \begin{pmatrix}10\\1\end{pmatrix}, \begin{pmatrix}12\\3\end{pmatrix}, \begin{pmatrix}13\\6\end{pmatrix}$	K3	CO5	1.1.1 2.1.3 2.4.1 13.3.1
10.	Construct the K - Dimensional Tree and perform space splitting for the six 2-dimensional data points: (30,40), (5,25), (10,12), (70,70), (50,30), (35,45). Identify and specify the cutting dimension at each level of the k-d tree.	K3	CO3	1.1.1 2.1.3 2.4.1 13.3.1

	Search for the data point (50,30) and elucidate the process of searching the data point. [Marks: K -D Tree - 4, Space splitting - 4, Searching - 4]			
	(Or)			
11.	Consider the dataset given below and construct the decision tree model using information gain with entropy as an impurity metric. Identify the root node and expand one of the branches of the tree till the leaf node to identify the class label. Finally, identify and write the logical expression for the constructed sub tree from root node to the leaf. [Marks: Tree- 10, logical expression - 2]	K3	CO3	1.1.1 2.1.3 2.4.1 13.3.1

Height	Hair	Eyes	Attractive?
Small	Blonde	Brown	No
Tall	Dark	Brown	No
Tall	Blonde	Blue	Yes
Tall	Dark	Blue	No
Small	Dark	Blue	No
Tall	Red	Blue	Yes
Tall	Blonde	Brown	No
Small	Blonde	Blue	Yes

Register No: | 3 | 1 | 2 | 2 | 2 | 1 | 5 | 0 | 0 | 1 | 0 | 6 | 6 |

Sri Sivasubramaniya Nadar College of Engineering, Kalavakkam – 603 110.

(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. / B.Tech. End Semester Theory Examinations, April / May 2024.

Sixth Semester

Computer Science and Engineering

UCS2604 PRINCIPLES OF MACHINE LEARNING

(Regulations 2021)

Time: **Three Hours** Maximum:**100 Marks**

K1: Remembering K2: Understanding K3: Applying K4: Analyzing K5: Evaluating

CO1:	Explain the basic concepts of machine learning
CO2:	Apply supervised algorithms for different classification problems
CO3:	Explain the need for ensemble methods
CO4:	Apply unsupervised and reinforcement learning techniques to various problems
CO5:	Apply dimensionality reduction and optimization techniques

Part – A (5 × 2 = 10 Marks)

		KL	CO	PI
1.	State the use of confusion matrix.	K1	CO1	1.4.1
2.	Define support vectors.	K1	CO2	1.4.1
3.	What does k signify in the K-NN algorithm?	K2	CO3	1.4.1
4.	Define Markov Decision Process.	K2	CO4	1.4.1
5.	PCA is an unsupervised learning approach. Justify.	K1	CO5	1.4.1

Part – B (5 × 6 = 30 Marks)

		KL	CO	PI
6.	Describe the method for creating training and test data. Summarize the effect of bias and variance in training and testing.	K2	CO1	1.1.1 1.4.1 2.1.3
7.	With a diagram, describe how McCulloch and Pitts neuron work.	K3	CO2	2.1.3 2.3.1
8.	Explain overfitting problem of the decision tree.	K3	CO3	1.4.1
9.	Outline the steps of Q-Learning.	K2	CO4	2.3.1 2.4.1
10.	Compare PCA and LDA in terms of their similarities and dissimilarities.	K2	CO5	1.4.1

Part – C (5 × 12 = 60 Marks)

		KL	CO	PI
11.	The following table gives a dataset about stolen vehicles. Using Naive Bayes classifier, classify the new data {Color: Red, Type: SUV, Origin: Domestic}	K3	CO1	1.1.1 2.1.3 13.3.1

Color	Type	Origin	Stolen
Red	Sports	Domestic	Yes
Red	Sports	Domestic	No
Red	Sports	Domestic	Yes
Yellow	Sports	Domestic	No
Yellow	Sports	Imported	Yes
Yellow	SUV	Imported	No
Yellow	SUV	Imported	Yes
Yellow	SUV	Domestic	No
Red	SUV	Imported	No
Red	Sports	Imported	Yes

(Or)

12.	For a classifier, the ground truth and the predicted output are given below Ground Truth 1 0 1 0 1 1 1 1 0 Trained classifier 0 0 1 0 0 1 0 1 1 Calculate the confusion matrix, accuracy, precision, and recall.	K3	CO1	1.1.1 2.1.3 13.3.1
13.	Describe Forward and Backward propagation in Multilayered Perceptron. Justify the use of learning rate in perceptron networks.	K2	CO2	2.4.1 13.3.1
	(Or)			
14.	Describe the concept and working of Support Vector Machine (SVM). How do we use SVM for multi-class classification?	K2	CO2	2.4.1 13.3.1

15.	The table given below shows the movie ticket booking pattern. Construct the decision tree and find the root node of the tree. **Show Time / Shooted / Actor / Genre / Book** MATINEE / IN DOOR / ALLU ARJUN / DRAMA / No MATINEE / IN DOOR / MOHANLAL / ACTION / No EVENING / IN DOOR / RAJANIKANTH / DRAMA / No EVENING / IN DOOR / MOHANLAL / COMEDY / No EVENING / OUT DOOR / ALLU ARJUN / COMEDY / No EVENING / OUT DOOR / RAJANIKANTH / COMEDY / No EVENING / IN DOOR / ALLU ARJUN / ACTION / No EVENING / OUT DOOR / MOHANLAL / COMEDY / No MATINEE / IN DOOR / MOHANLAL / DRAMA / No MATINEE / OUT DOOR / RAJANIKANTH / COMEDY / Yes EVENING / OUT DOOR / MOHANLAL / ACTION / Yes MATINEE / OUT DOOR / ALLU ARJUN / ACTION / Yes MATINEE / IN DOOR / MOHANLAL / COMEDY / Yes EVENING / OUT DOOR / RAJANIKANTH / ACTION / Yes	K4	CO3	1.1.1 2.1.3 2.4.1 13.3.1
	(Or)			
16.	Construct a Kd-Tree with the following points: *A(2, 3), B(4, 2), C(4, 5), D(3, 3), E(1, 5), F(4, 4)*. Further, show how the 2D plane is bisected as points are inserted. On the axes, draw each point as well as the horizontal or vertical lines that bisect the plane through each point. *Note: Be careful when inserting (4, 4) as ties are treated the same as greater than.*	K4	CO3	1.1.1 2.1.3 2.4.1 13.3.1
17.	Cluster the following eight points (with (x, y) representing locations) into three clusters using k-means clustering and find the three cluster centers after the second iteration. The points and their coordinates are *A1(2, 10), A2(2, 5), A3(8, 4), A4(5, 8), A5(7, 5), A6(6, 4), A7(1, 2), A8(4, 9)*. Initial cluster centers are: *A1(2, 10), A4(5, 8)* and *A7(1, 2)*	K4	CO4	2.3.1 2.4.1
	(Or)			
18.	Prove that Q-learning and SARSA solves the problem of cliff walking environment using optimal and safer paths.	K4	CO4	2.3.1 2.4.1

19.	Compute the principal components and reduce the dimensions. **Features** | **Sample 1** | **Sample 2** | **Sample 3** | **Sample 4** x | 4 | 8 | 13 | 7 y | 11 | 4 | 5 | 14	K3	CO5	1.1.1 2.1.3 2.4.1 13.3.1
	(Or)			
20.	Consider the given samples belonging to two classes, W1 and W2. Apply LDA to transform the data into k-dimensional space. $W1: \binom{4}{3}, \binom{2}{5}, \binom{4}{8}$ $W2: \binom{6}{2}, \binom{11}{3}, \binom{9}{4}$	K3	CO5	1.1.1 2.1.3 2.4.1 13.3.1

Register Number | 3 | 1 | 9 | 2 | 2 | 1 | 5 | 0 | 0 | 1 | 0 | 6 | 6 |

Sri Sivasubramaniya Nadar College of Engineering, Kalavakkam – 603 110

(An Autonomous Institution, Affiliated to Anna University, Chennai)

Department of Computer Science and Engineering

Continuous Assessment Test – I

Regulations – R2021

Degree & Branch	BE - Computer Science and Engineering				**Semester**	VI
Subject Code & Name	**UCS2626 - Natural Language Processing and Applications**					
Academic Year	**2023-2024 EVEN**	**Batch**	**2021-2025**	**Date**	**20-03-2024**	**FN**
Time: 08:10 - 09:40 a.m (90 Minutes)	**Answer All Questions**				**Maximum: 50 Marks**	

(K1: Remembering, K2: Understanding, K3: Applying, K4: Analyzing, K5: Evaluating)

CO1:	Apply text pre-processing techniques and build the language models (K3)
CO2:	Apply basic levels of knowledge at word level and syntax level in language processing (K3)
CO3:	Apply computational methods in lexical and vector semantics (K3)
CO4:	Explain discourse processing and machine translation systems (K2)
CO5:	Apply learning algorithms for various NLP applications (K3)

Part – A (4 × 2 = 8 Marks)

		KL	CO	PI
1.	What is Natural language processing and list a few applications?	K1	CO1	1.3.1
2.	Construct the regular expression to find all the instances of ***"the"*** in a text.	K3	CO1	1.1.1
3.	Identify the tagging error in each of the following sentences that are tagged with Penn Treebank tagset a. *Does/VBZ this/DT flight/NN serve/VB dinner/NNS* b. *Can/VBP you/PRP list/VB the/DT nonstop/JJ afternoon/NN flights/NNS*	K3	CO2	1.3.1
4.	Construct the parse tree for the sentence *"The man read this book"* using the grammar given below	K3	CO2	2.1.2

1	0	6	6

– 603 110

	S → NP VP S → Aux NP VP S → VP NP → Det NOM NOM → Noun NOM → Noun NOM VP → Verb VP → Verb NP	Det → *that* | *this* | *a* | *the* Noun → *book* | *flight* | *meal* | *man* Verb → *book* | *include* | *read* Aux → *does*			

Part – B (3×6 = 18 Marks)

		KL	CO	PI
5.	Explain Byte Pair Encoding (BPE) algorithm with example.	K2	CO1	1.3.1 13.3.1
6.	Discuss the various knowledge levels in Natural Language Processing with examples.	K2	CO1	1.3.1 13.3.1
7.	Explain the problems with top-down parsing technique.	K2	CO2	2.1.3

Part – C (2 × 12 = 24 Marks)
(Any subdivisions should be either 7+5 or 8+4)

		KL	CO	PI
8.	Apply minimum edit distance algorithm to compute distance between ***'Hyundai'*** and ***'Honda'*** using dynamic programming. Augment the minimum edit distance algorithm to back trace in order to output an alignment.	K3	CO1	2.1.2
	(Or)			
9.	Explain the probabilistic language model and construct bi-gram language model for the test sentence **Training set** • *There is a big garden.* • *Children play in a garden* • *They play inside beautiful garden* **Test sentence** *They play in a big Garden*	K3	CO1	2.1.2
10.	1. Consider 3 POS tags that are noun, model and verb. For the following sentences ***<S> Mary Jane can see Will </S>*** ***<S> Spot will see Mary </S>*** ***<S> Will Jane spot Mary? </S>*** ***<S> Mary will pat Spot </S>***	K3	CO2	2.1.3

	Construct the Transition probability and Emission probability matrix for the given training sentences.			
	(Or)			
11.	Consider the following CNF grammar and apply CYK algorithm to parse the sentence *"Astronomers saw stars with ears"*. S→ NP VP PP → P NP VP → V NP VP→ VP PP NP → NP PP P→ with V → saw NP → astronomers NP→ ears NP → saw NP → stars NP → telescopes	K3	CO2	2.1.3

Register Number | 3 | 1 | 2 | 2 | 2 | 1 | 5 | 0 | 0 | 1 | 0 | 6 | 6 |

Sri Sivasubramaniya Nadar College of Engineering, Kalavakkam – 603 110

(An Autonomous Institution, Affiliated to Anna University, Chennai)

Department of Computer Science and Engineering

Continuous Assessment Test – II

Regulations – R2021

Degree & Branch	BE - Computer Science and Engineering				**Semester**	VI
Subject Code & Name	**UCS2626 - Natural Language Processing and Applications**					
Academic Year	**2023-2024 EVEN**	**Batch**	**2021-2025**	**Date**	**30-04-2024**	**FN**
Time: 08:10 - 09:40 a.m (90 Minutes)	**Answer All Questions**				**Maximum: 50 Marks**	

(K1: Remembering, K2: Understanding, K3: Applying, K4: Analyzing, K5: Evaluating)

CO1:	Apply text pre-processing techniques and build the language models (K3)
CO2:	Apply basic levels of knowledge at word level and syntax level in language processing (K3)
CO3:	Apply computational methods in lexical and vector semantics (K3)
CO4:	Explain discourse processing and machine translation systems (K2)
CO5:	Apply learning algorithms for various NLP applications (K3)

Part – A (4 × 2 = 8 Marks)

		KL	CO	PI
1.	Explain the following with suitable examples: Homonymy, Polysemy, Synonymy, Antonymy	K2	CO3	1.3.1
2.	Explain the need for coreference resolution in NLP applications.	K2	CO4	1.4.1
3.	Explain the term "Anaphora" with an example	K2	CO4	1.3.1
4.	Define the metrics precision, recall and F1-score.	K1	CO5	2.1.2

Part – B (3×6 = 18 Marks)

		KL	CO	PI
5.	Apply cosine similarity algorithm to find the similarity between the words (Cherry, information) and (digital, information) using the following table	K3	CO3	1.1.1

			pie	data	computer	
		cherry	442	8	2	
		digital	5	1683	1670	
		information	5	3982	3325	
6.	Explain mention-pair architecture in detail with suitable examples.				K2	CO4	1.4.1 13.3.1
7.	Explain Word2Vec using skip-gram algorithm in detail.				K2	CO3	2.1.3

Part – C (2 × 12 = 24 Marks)
(Any subdivisions should be either 7+5 or 8+4)

		KL	CO	PI
8.	Consider a corpus with the following 5 documents. **Doc1: The quick brown fox jumps over the lazy dog** **Doc2: The lazy dog likes to sleep all day** **Doc3: The brown fox prefers to eat cheese** **Doc4: The red fox jumps over the brown fox** **Doc5: The brown dog chases the fox** Apply the TF-IDF method to compute scores for the word **"fox"** in each of these documents.	K3	CO3	2.1.2
	(Or)			
9.	Consider the co-occurrence counts for 4 words in five contexts from the wikipedia corpus	K3	CO3	2.1.2

	computer	data	result	pie	sugar
cherry	2	8	9	442	25
strawberry	0	0	1	60	19
digital	1670	1683	85	5	4
information	3325	3982	378	5	13

Apply PPMI function to compute the PPMI score between **"information"** and **"data".**

10.	Given the following short movie reviews, each labeled with a genre, either **comedy or action:** 1. fun, couple, love, love **comedy** 2. fast, furious, shoot **action** 3. couple, fly, fast, fun, fun **comedy**	K3	CO5	2.3.1 13.2.1

	4. furious, shoot, shoot, fun **action** 5. fly, fast, shoot, love **action** A new document D: *fast, couple, shoot, fly* Compute the most likely class for D. Apply a naive Bayes classifier with add-1 smoothing to compute the likelihoods.			
	(OR)			
11.	Consider the following text corpus and apply Naïve Bayes algorithm to classify the test data **"lottery"** as spam or ham	K3	CO5	2.3.1 13.2.1

Text	Category
Congratulation you are selected	ham
Congrats you won lottery	spam
travel for free	spam
selected for credit cards	spam
very Good	ham
Good night	ham

Register No: | 3 | 1 | 2 | 2 | 2 | 1 | 5 | 0 | 0 | 1 | 0 | 6 | 6 |

Sri Sivasubramaniya Nadar College of Engineering, Kalavakkam – 603 110.

(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. / B.Tech. End Semester Theory Examinations, April / May 2024.

Sixth Semester

Computer Science and Engineering

UCS2626 NATURAL LANGUAGE PROCESSING AND APPLICATIONS

(Regulations 2021)

Time: **Three Hours** Maximum:**100 Marks**

K1: Remembering K2: Understanding K3: Applying K4: Analyzing K5: Evaluating

CO1:	Apply text pre-processing techniques and build the language models (K3)
CO2:	Apply basic levels of knowledge at word level and syntax level in language processing (K3)
CO3:	Apply computational methods in lexical and vector semantics (K3)
CO4:	Explain discourse processing and machine translation systems (K2)
CO5:	Apply learning algorithms for various NLP applications (K3)

Part – A (5 × 2 = 10 Marks)

		KL	CO	PI
1.	List four real time NLP applications that you use in your day-to-day life.	K1	CO1	1.3.1
2.	List any two algorithms that are widely used for POS tagging task.	K1	CO2	1.1.1
3.	Define a word vector with example.	K1	CO3	1.3.1
4.	"*Victoria Chen, CFO of Megabucks Banking, saw her pay jump to $2.3million, as the 38-year-old became the company's president. It is widely known that she came to Megabucks from rival Lotsabucks.*". In the given example, list the words that corefer.	K2	CO4	1.3.1
5.	Define Precision and Recall with necessary equations.	K1	CO5	2.1.2

	Part – B (5 × 6 = 30 Marks)	KL	CO	PI
6.	*"Mr. Smith's phone number is +1 (555) 123-4567. Mr. Johnson's office number is 12345."*. Construct a regular expression to extract the names that has prefix "Mr" and the digits from the above given example.	K3	CO1	1.1.1
7.	S -> NP VP NP -> Det N | Det N PP VP -> V NP PP -> P NP Det -> 'The' N -> 'cat' | 'mouse' | 'tail' V -> 'chased' P -> 'with' With the above given context free grammar, construct a parse tree for the sentence, "*The cat chased the mouse with a long tail*" Using top-down parsing mechanism.	K3	CO2	2.1.2
8.	Consider a corpus with the following 3 documents. **Doc1: The quick brown fox jumps over the lazy dog** **Doc2: The lazy dog likes to sleep all day** **Dco3: The brown fox prefers to eat cheese** Apply the TF-IDF method to compute the scores for the word **"fox"** in each of these documents.	K3	CO3	2.1.2
9.	Explain the working of Mention-Pair architecture.	K2	CO4	1.4.1
10.	Apply a suitable algorithms to extract **'is-a'** relationships between entities. Provide an example sentence and demonstrate how your system accurately identifies and extracts the semantic relation.	K3	CO5	2.1.2

Part – C (5 × 12 = 60 Marks)

<table>
<tr><th></th><th></th><th>KL</th><th>CO</th><th>PI</th></tr>
<tr><td>11.</td><td>Apply minimum edit distance algorithm to compute distance between 'Hyundai' and 'Honda' using dynamic programming. Augment the minimum edit distance algorithm to back trace in order to output an alignment.</td><td>K3</td><td>CO1</td><td>2.1.2</td></tr>
<tr><td colspan="5">(Or)</td></tr>
<tr><td>12.</td><td>Explain the probabilistic language model and construct bi-gram language model using the training set and compute the probability for the test sentence
Training set
• There is a big garden
• Children play in a garden
• They play inside beautiful garden
Test sentence
They play in a big garden</td><td>K3</td><td>CO1</td><td>2.1.2</td></tr>
<tr><td colspan="5"></td></tr>
<tr><td>13.</td><td>Develop a Hidden Markov Model (HMM) for parts-of-speech tagging and explain how it can be used to assign the most probable part-of-speech tags for the sentence "Justin will spot Will"</td><td>K2</td><td>CO2</td><td>2.1.3</td></tr>
<tr><td colspan="5">(Or)</td></tr>
<tr><td>14.</td><td>Consider the following CNF grammar and apply CYK algorithm to parse the sentence "I shot an elephant in my pajamas" .
<table>
<tr><td>S→ NP VP
PP → IN NP
NP→DET NP
NP→NP PP
VP → VBD NP

VP→ VP PP
NP → PRP$ NP</td><td>DET→ an
VBD → shot
NP → Pajamas
NP→ elephant
NP → I
PRP → I
IN → in
PRP$ → my</td></tr>
</table></td><td>K2</td><td>CO2</td><td>2.1.3</td></tr>
<tr><td colspan="5"></td></tr>
<tr><td>15.</td><td>Explain the impact of Word Sense Disambiguation task in semantic analysis of text. Justify your answer using a suitable algorithm.</td><td>K2</td><td>CO3</td><td>2.1.2</td></tr>
</table>

<table>
<tr><td colspan="5">(Or)</td></tr>
<tr><td>16.</td><td>Explain the Skip-gram model in natural language processing help in capturing the contextual meaning of words by predicting the surrounding words within a given window size?</td><td>K2</td><td>CO3</td><td>2.1.2</td></tr>
<tr><td colspan="5"></td></tr>
<tr><td>17.</td><td>Explain Encoder and Decoder architecture using RNN to build a language model.</td><td>K2</td><td>CO4</td><td>2.1.3</td></tr>
<tr><td colspan="5">(Or)</td></tr>
<tr><td>18.</td><td>Explain in detail about Machine Translation Pipeline. Use your own choice of source and target Language Pairs to support your answer.</td><td>K2</td><td>CO4</td><td>2.1.3</td></tr>
<tr><td colspan="5"></td></tr>
<tr><td>19.</td><td>Consider the following training dataset and apply Naïve bayes classifier to classify the Test Dataset: “This is boring and pathetic”

Training Dataset:
<table><tr><th>Document</th><th>Class</th></tr><tr><td>Boring and predictable</td><td>Negative</td></tr><tr><td>Excellent Movie</td><td>Positive</td></tr><tr><td>Extremely mediocre</td><td>Negative</td></tr><tr><td>A pathetic attempt at a romcom</td><td>Negative</td></tr><tr><td>Good movie with great actors</td><td>Positive</td></tr><tr><td>Fantastic job!</td><td>Positive</td></tr></table></td><td>K5</td><td>CO5</td><td>2.3.1
13.2.1</td></tr>
<tr><td colspan="5">(Or)</td></tr>
<tr><td>20.</td><td>Consider a corpus with the following 4 documents.

Document 1: "The cat chased the mouse."
Document 2: "The mouse ran away from the cat."
Document 3: "The dog barked at the cat."
Document 4: "The cat slept peacefully."
Apply the Vector space model to the rank the given documents for the query “at the cat”.</td><td>K5</td><td>CO5</td><td>2.3.1
13.2.1</td></tr>
</table>

Sri Sivasubramaniya Nadar College of Engineering, Kalavakkam 603 110

(An Autonomous Institution, Affiliated to Anna University, Chennai)

ENGLISH

Continuous Assessment Test - I

Regulations – R2021

Degree	B.E. / B. Tech.	Branch	Common to all branches
Semester	VI	Date of CAT	29-04-2024
Subject Code & Name	**UEN2041 & ENGLISH FOR CAREER NEEDS**		
Time: 90 Minutes	Answer All Questions		Maximum: 50 Marks

(K1: Remembering, K2: Understanding, K3: Applying, K4: Analyzing, K5: Evaluating)

CO1:	To raise awareness on opportunities for higher studies and career
CO2:	To train the students in communication specific to employment needs
CO3:	To orient the students towards grooming as a professional
CO4:	To understand one's potential and make the right career choice
CO5:	To help students improve their body language

Part – A (4 × 2 = 8 Marks)

		KL	CO	PI
1.	Emotional Intelligence is an important skill for leaders to have. Do you agree?	KL2	CO3	10.1.4 10.2.3
2.	Have you ever used intuition or prior experience to anticipate and address a problem effectively? Provide an example.	KL4	CO3	10.1.4 10.2.3
3.	What are your weaknesses? How are you working to overcome them?	KL3	CO4	10.1.4 10.2.3
4.	Where do you see yourself in five years? Justify your answer with specific skill enhancement you would focus on.	KL3	CO2	10.1.4 10.2.3

Part – B (3×6 = 18 Marks)

		KL	CO	PI
5.	Consider a challenge you have encountered recently in your academic life, using the STAR (Situation, Task, Action, Result) format, briefly analyze the steps taken to solve the problem.	KL4	CO3	10.1.4 10.2.3
6.	Imagine you have been asked to speak on the topic, "Should we have free education?" for a Group Discussion. How would you argue in favour of free education? Provide 3 compelling arguments supported by evidence?	KL5	CO2	10.1.4 10.2.3
7.	What type of a leader are you? Recall a leadership role you have undertaken in any project or activity. Justify with suitable examples.	KL5	CO4	10.1.4 10.2.3

Part – C (2 × 12 = 24 Marks)

		KL	CO	PI
8.	Create 6 presentation slides on the following topic: "The importance of socialization in college." (Hints: Building relationships – personal growth – mental well-being – academic success – holistic development)	KL4	CO2	10.1.2 10.1.3 10.1.4 10.3.1 10.3.2
	(Or)			
9.	Your dream company has announced an opening for a paid internship for six months. Respond to the opening with a cover letter and curriculum vitae detailing your suitability for the opening.	KL3	CO3	10.1.2 10.1.3 10.1.4
10.	Social media includes platforms like Facebook(Meta), Instagram, Twitter, LinkedIn, etc, where people can connect. Today almost everyone has a user account on at least one of the many platforms. There are multiple advantages of social media while also including certain disadvantages. Elaborate with three points on the pros and cons of the given topics in about 400 words.	KL5	CO3	10.1.4 10.2.3
	(Or)			
11.	Write a Statement of Purpose for a master's program at a foreign university. Describe your academic and professional background, your motivations for applying. and how the program aligns with your career goals. Emphasize any skills or experiences that make you a strong candidate and explain how studying in a foreign country supports your long-term objectives.	KL3	CO3	10.1.2 10.1.3 10.1.4

Register No: | 3 | 1 | 2 | 2 | 2 | 1 | 5 | 0 | 0 | 1 | 0 | 6 | 6 |

Sri Sivasubramaniya Nadar College of Engineering, Kalavakkam – 603 110.

(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. / B.Tech. End Semester Theory Examinations, April / May 2024.

Sixth Semester

Civil Engineering

UEN2041 ENGLISH FOR CAREER NEEDS

(Common to Mechanical Engineering, Chemical Engineering, Electrical and Electronics Engineering, Electronics and Communication Engineering, Biomedical Engineering, Computer Science and Engineering and Information Technology)

(Regulations 2021)

Time: **Three Hours** Maximum:**100 Marks**

K1: Remembering K2: Understanding K3: Applying K4: Analyzing K5: Evaluating

CO1:	To raise awareness on opportunities for higher studies and career.
CO2:	To train the students in communication specific to employment needs.
CO3:	To orient the students towards grooming as a professional.
CO4:	To understand one's potential and make the right career choice.
CO5:	To help students improve their body language.

Part – A (5 × 2 = 10 Marks)

		KL	CO	PI
1.	Mention any two benefits and challenges of pursuing higher education in a foreign country?	K2	CO1	10.1.1 10.1.2 10.1.3
2.	Define career related skills and give examples.	K1	CO5	10.1.2 10.1.3
3.	What are the unique soft-skill challenges posed by remote work (work from home), and how to overcome these challenges?	K2	CO2	10.1.2 10.1.3
4.	Write any two key dos and don'ts during a GD?	K1	CO4	10.1.2 10.1.3
5.	Write the importance of visual aids in effective presentation?	K2	CO2	10.1.2 10.1.3

Part – B (5 × 6 = 30 Marks)

		KL	CO	PI
6.	How do adaptability and flexibility contribute to career development in a rapidly changing industry environment? Give examples to substantiate your answer.	K2	CO3	10.1.2 10.1.3
7.	Discuss any three types of interviews employers use in recruitment process?	K2	CO5	10.1.2 10.1.3

8.	Write a short note on the importance of interpersonal skills in Group Discussion?	K3	CO3	10.1.2 10.1.3
9	Provide six effective strategies for creating effective and appealing power point presentations.	K3	CO4	10.2.1 10.2.2
10.	What are the characteristics of a good leader. Give an example by recalling an incident in your academic life where you exhibited your leadership qualities.	K3	CO2	10.2.1 10.2.2 10.2.3

Part – C (5 × 12 = 60 Marks)

		KL	CO	PI
11.	Write a Statement of Purpose for a master's program at a foreign university. Describe your academic and professional background, your motivations for applying, and how the program aligns with your career goals. Emphasize any skills or experiences that make you a strong candidate and explain how studying in a foreign country supports your long-term career objectives.	K5	CO4	10.1.2 10.1.3
	(Or)			
12.	Predominantly after engineering, students get placed or prefer to work in private sectors. However, private sector jobs are limited. What sector do you prefer to work? Elaborate on the advantages and disadvantages.	K5	CO3	10.1.2 10.1.3
13.	Write the dos and don'ts that should be followed in an interview concerning the following factors: a) appearance and demeanor, b) preparing and responding to interviewer's questions, c) asking your questions to interviewer.	K4	CO2	10.1.2 10.1.3
	(Or)			
14.	Prepare a cover letter and a resume for the position of "Junior Engineer" in your dream company. Include necessary details.	K4	CO3	10.1.2 10.1.3
15.	Imagine that you are asked to speak on the topic, "Renewable energy: Is it the key to our future?" for a Group Discussion. Mention five key ideas you would put forward in the discussion and support your ideas with details in about 500 words.	K5	CO2	10.2.2 10.2.3
	(Or)			
16.	Assume that you are planning to pursue higher studies. Do you prefer to study in India or abroad? Give reasons.	K5	CO3	10.1.2 10.1.3 10.1.4

17.	Describe a situation where you had a conflict with a team member? Use the STAR Technique, analyze and explain how you overcame it.	K4	CO4	10.2.2 10.2.3
	(Or)			
18.	Do you prefer to work in a team or individually? Substantiate your choice by highlighting the advantages. Also, discuss the disadvantages of both situations.	K4	CO4	10.2.2 10.2.3
19.	Prepare six presentation slides on the following topic: The importance of providing free medical facilities to all citizens in India.	K5	CO3	10.1.3 10.1.4
	(Or)			
20.	Explain the role of storytelling and body language in presentations. How can integrating stories improve the impact of the presentation?	K5	CO2	10.1.4 10.1.2

Register Number | 3 | 1 | 2 | 2 | 2 | 1 | 5 | 0 | 0 | 1 | 0 | 6 | 6 |

Sri Sivasubramaniya Nadar College of Engineering, Kalavakkam – 603 110

(An Autonomous Institution, Affiliated to Anna University, Chennai)

Department of Computer Science and Engineering

Continuous Assessment Test – I

Regulations – R2021

Degree & Branch	B.E & CSE				**Semester**	6
Subject Code & Name	**UCS2H27 – Business Intelligence**					
Academic Year	2023-2024 EVEN	**Batch**	2021-2025	**Date**	21.03.2024	**AN**
Time: 08:15 - 09:45 AM (90 Minutes)	**Answer All Questions**				**Maximum: 50 Marks**	

(K1: Remembering, K2: Understanding, K3: Applying, K4: Analyzing, K5: Evaluating)

CO1:	Explain various types of business analytics (K2)
CO2:	Apply business intelligence concepts for data modelling (K3)
CO3:	Apply statistical tests in testing hypothesis on data (K3)
CO4:	Analyse data by utilizing various data mining approaches (K4)
CO5:	Build applications using business analytics tools (K3)

Part – A (4 × 2 = 8 Marks)

		KL	CO	PI
1.	Compare data analysis and data reporting.	K2	CO1	1.3.1 1.4.1
2.	Explain how prescriptive analytics relate to descriptive and predictive analytics.	K2	CO1	1.3.1 1.4.1
3.	A sample of size 100 is drawn from a population of size 776 with a mean of 45 and a standard deviation of 3.6. Make use of appropriate formulas to compute the standard error of the mean.	K3	CO3	1.3.1 1.4.1 13.3.1
4.	A research investigator collected data on savings and investments from 16 households. Savings showed a mean of Rs.6565.00 and a variance of Rs.250.00. As against this, the mean investment was found as Rs.4525.00 and variance as Rs.520.00. Consider the coefficient of correlation between savings and investment is 0.67. Apply probabilistic concepts to find the most approximate value of savings against an investment of Rs. 9000 and also find the value of investment against a savings of Rs.5600.	K3	CO3	1.3.1 1.4.1 13.3.1

Part – B (3×6 = 18 Marks)

		KL	CO	PI
5.	Compare and contrast descriptive, predictive, and prescriptive analytics.	K2	CO1	1.3.1 1.4.1
6.	Mr. Lakshmanan, a business analyst, works as Marketing Function Head for a consumer packages goods company, which manufactures several products. Ram is in charge of all business analytics and has to answer his	K3	CO1	1.3.1 1.4.1 2.1.2

	boss, Mr. Ram, General Manager. Lakshmanan has to deal with two issues, i) sales was not as expected, and ii) have to devise a strategy for improving the marketing plan. Analyze the impact of using predictive and prescriptive analytics for the given scenario.			
7.	A sample of 100 patients was chosen to estimate the length of stay at a hospital. The sample mean of stay was 4.5, and the population standard deviation of stay was known to be 1.2. Apply probabilistic concepts to (a) calculate the 95% confidence interval for the population mean. (b) find the probability that the population mean of stay is greater than 4.73?	K3	CO3	1.3.1 1.4.1 2.1.2

Part – C (2 × 12 = 24 Marks)
(Any subdivisions should be either 7+5 or 8+4)

		KL	CO	PI
8.	Big Data concepts can be applied in the domains listed below: Agriculture/Insurance/Healthcare/Finance. Chose anyone domain and explain in terms of, i) Big Data Characteristics, ii) Data Types, and iii) Data Analytics Types.	K2	CO1	1.3.1 1.4.1 2.1.2
	(Or)			
9.	Elaborate the evolution of business analytics by writing down the features of analytics (i.e., its application, tools used) as employed in the following eras: • Prehistoric • Industrial (1800s) • Information Age (mid-20th century) • Internet Age (21st century)	K2	CO1	1.3.1 1.4.1 2.1.2
10.	a. Black boxes used in aircraft are manufactured by three companies: A, B, and C. 75% are manufactured by A, 15% by B, and 10% by C. The defect rates of black boxes manufactured by A, B, and C are 4%, 6%, and 8%, respectively. If a black box tested randomly is found to be defective, apply Baye's Theorem to find the probability that it is manufactured by company A? [7] b. Farm Fresh is an online grocery store. It has an innovative feature that predicts whether the customer has forgotten to buy an item, which is very common among customers who buy grocery items. The probability that a customer will buy milk during each shopping visit is 0.2. Make use of a suitable probability distribution to calculate the probability that the customer's first purchase of milk happens during the fifth visit. Calculate the average time between purchases of milk. [5]	K3	CO3	1.3.1 1.4.1 2.1.2 13.3.1
	(Or)			
11.	a. Compute the Karl Pearson coefficient of correlation between the average share prices of two companies over the past 12 months.	K3	CO3	1.3.1 1.4.1 2.1.2 13.3.1

X	275	288	290	320	311	319	301	274	324	260	264	290
Y	219	243	246	251	241	245	232	222	232	211	202	204

Make use of the correlation coefficient to support your conclusion about the relationship between the share prices of the two companies. [8]
b. Consider two lines of regression given by $x + 2y - 5 = 0$ and $2x + 3y - 8 = 0$. Solve the equations to find the means of X and Y, and also calculate the variance of Y if X=12. [4]

Register Number | 3 | 1 | 2 | 2 | 2 | 1 | 5 | 0 | 0 | 1 | 0 | 6 | 6 |

Sri Sivasubramaniya Nadar College of Engineering, Kalavakkam – 603 110

(An Autonomous Institution, Affiliated to Anna University, Chennai)

Department of Computer Science and Engineering

Continuous Assessment Test – II

Regulations – R2021

Degree & Branch	B.E & CSE				**Semester**	6
Subject Code & Name	**UCS2H27 – Business Intelligence**					
Academic Year	2023-2024 EVEN	**Batch**	2021-2025	**Date**	03.05.2024	**AN**
Time: 04:00 PM-05:30 PM (90 Minutes)	**Answer All Questions**				**Maximum: 50 Marks**	

(K1: Remembering, K2: Understanding, K3: Applying, K4: Analyzing, K5: Evaluating)

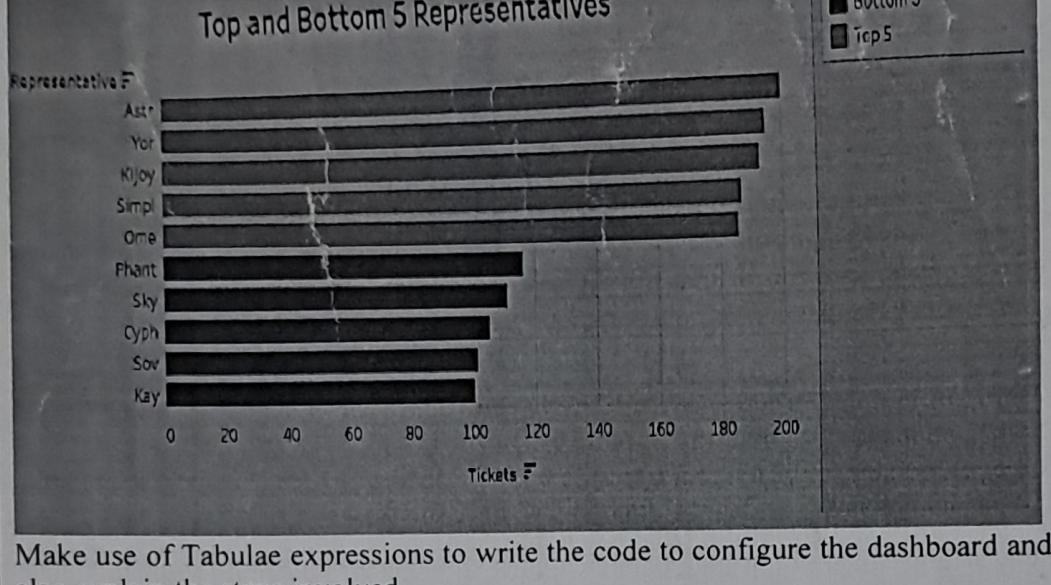
CO1:	Explain various types of business analytics (K2)
CO2:	Apply business intelligence concepts for data modelling (K3)
CO3:	Apply statistical tests in testing hypothesis on data (K3)
CO4:	Analyse data by utilizing various data mining approaches (K4)
CO5:	Build applications using business analytics tools (K3)

Part – A (4 × 2 = 8 Marks)

		KL	CO	PI
1.	With a neat sketch, explain the architecture of business intelligence.	K2	CO2	1.3.1 1.4.1
2.	Compare Classification and Clustering.	K2	CO4	4.3.1
3.	The below table gives information as *ages* and *cholesterol* levels for random sample of 10 men. Age: 58, 69, 43, 39, 63, 52, 47, 31, 74, 36 Cholesterol Level: 189, 235, 193, 177, 154, 191, 213, 165, 198, 181 Taking *age* as an independent variable and *cholesterol level* as a dependent variable, make use of linear regression concept to compute $SS_{xx}, SS_{yy}, SS_{xy}$.	K3	CO4	4.3.1 5.1.1
4.	Explain the difference between a dimension and a measure in Tableau.	K2	CO5	5.1.1

Part – B (3×6 = 18 Marks)

		KL	CO	PI
5.	Explain the various steps in the Knowledge Discovery from Data (KDD) process. Justify that data mining is merely an essential step in this process.	K2	CO2	1.3.1 1.4.1
6.	Construct the frequent pattern using the Apriori algorithm for the given data in the transaction table and generate association rules. Let min_sup= 60% and min_conf=80%. T100: Crayon, Markers, Highlighter, Sharpener T200: Highlighter, Markers, Ruler, Pen, Sharpener T300: Ruler, Markers, Sharpener, Pen	K3	CO4	4.3.1 5.1.1 13.2.1

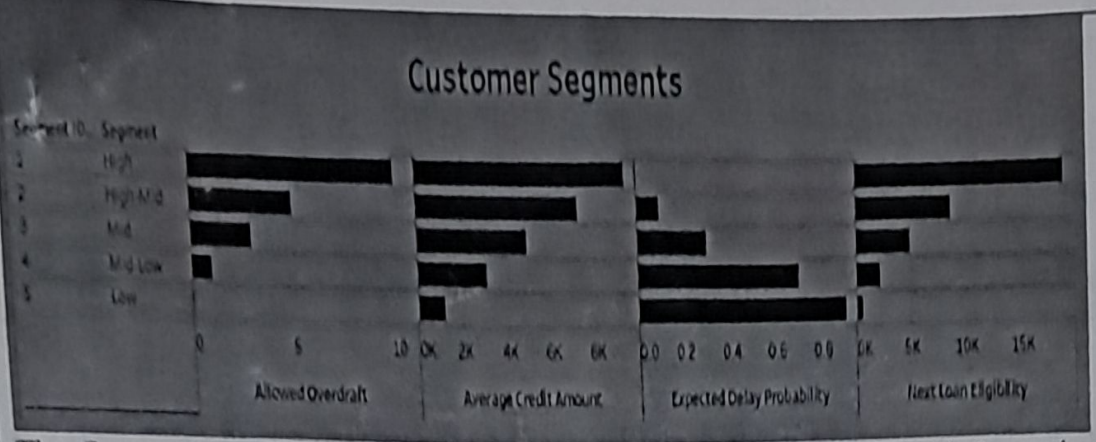
	T400 Sharpener, Markers, Highlighter				
7.	Your manager asked you to create a dashboard that shows the performance of call centre representatives. One of the reporting requirements is to show the top and bottom 5 representatives according to the number of closed tickets. The visualization should look like as shown in the below figure:  Top and Bottom 5 Representatives Top and Bottom 5 filter Bottom 5 Top 5 Representative Astr Yor Kijoy Simpl Ome Phant Sky Cyph Sov Kay 0 20 40 60 80 100 120 140 160 180 200 Tickets Make use of Tabulae expressions to write the code to configure the dashboard and also explain the steps involved.	K3	CO5	5.1.1 14.4.2

Part – C (2 × 12 = 24 Marks)
(Any subdivisions should be either 7+5 or 8+4)

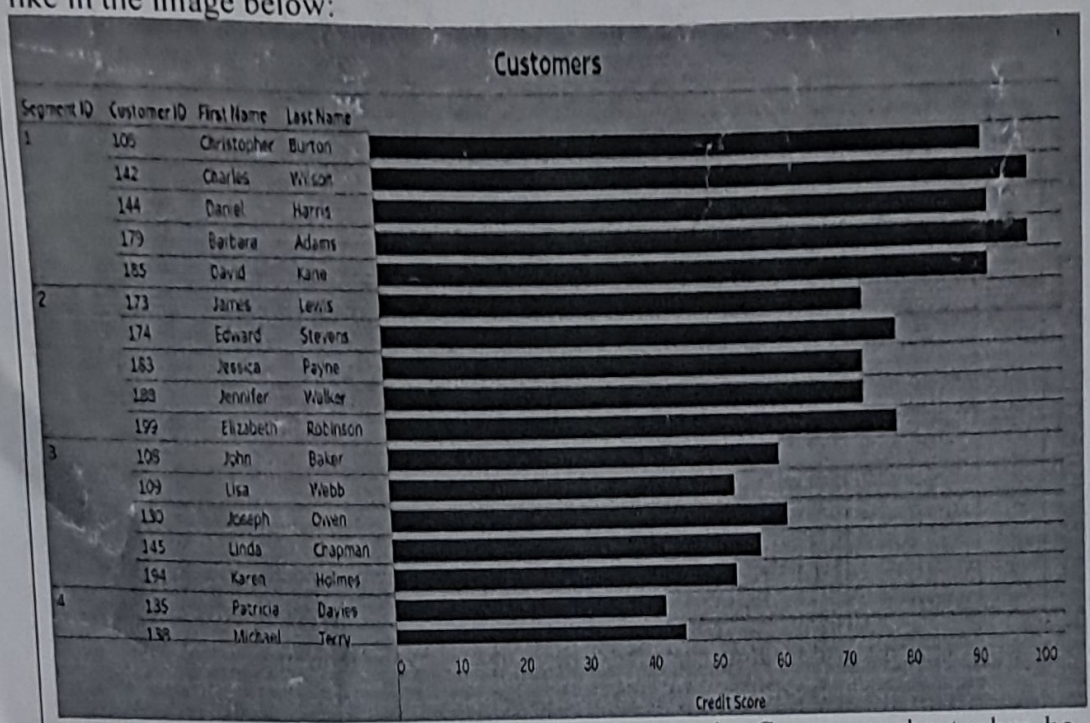
		KL	CO	PI
8.	Consider a data mining task that cluster the following eight points, A1, A2, A3, B1, B2, B3, C1, C2, with (X, Y) representing co-ordinates, into three clusters. The co-ordinates are A1(2,10), A2(2,5) , A3(8,4) , B1(5,8) , B2(7,5) , B3(6,4) , C1(1,2) , C2(4,9). The distance function to be used is Euclidean distance. Initially, A1, B1, and C1 are assigned as the centres of each cluster. Write the steps of the K-means algorithm and utilize the K-means clustering algorithm to cluster the given data points into three clusters. Show the cluster centres after the first round of clustering.	K3	CO4	1.3.1 4.3.1 5.1.1 14.4.2
	(OR)			
9.	Write down the steps in the K-Medoids algorithm. Consider the data mining task to cluster the ten points (X, Y) given in the table representing the distance as two clusters. Consider the T_id values 5 and 10 as your initial clusters and apply the K-Medoids algorithm (one iteration) with Manhattan distance as the cost measure.	K3	CO4	1.3.1 4.3.1 5.1.1 14.4.2

T_id	1	2	3	4	5	6	7	8	9	10
X	7	2	3	8	7	4	6	7	6	3
Y	6	6	8	5	4	7	2	3	4	4

10.	a. Compare Power BI with Tableau. [5] b. You have a Tableau workbook with 2 sheets. The *Customer Segments* sheet demonstrates segments of customers, the number of customers per segment, and the main characteristics of the segments, as shown in the image given below.	K2	CO5	5.1.1 14.4.2



The *Customers* sheet shows the list of all customers and their detailed information, like in the image below:



The manager wants to see the list of customers on the *Customers* sheet when he specifies a group (High, High Mid, Mid, Mid Low & Low) from the *customer segment* sheet. Outline the steps. [7]

(OR)

11.	a. Explain DAX and the way it is important for a data analyst. [5] b. Explain the process of blending data in Tableau and list the steps to optimize the performance in Tableau when working with large datasets. [7]	K2	CO5	5.1.1 14.4.2

Register No: | 3 | 1 | 2 | 2 | 2 | 1 | 5 | 0 | 0 | 1 | 0 | 6 | 6 |

Sri Sivasubramaniya Nadar College of Engineering, Kalavakkam – 603 110.

(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. / B.Tech. End Semester Theory Examinations, April / May 2024.

Sixth Semester

Computer Science and Engineering

UCS2H27 BUSINESS INTELLIGENCE

(Regulations 2021)

Statistical Table to be provided

Time: **Three Hours** Maximum:**100 Marks**

K1: Remembering K2: Understanding K3: Applying K4 :Analyzing K5: Evaluating

CO1:	Explain various types of business analytics (K2)
CO2:	Apply business intelligence concepts for data modelling (K3)
CO3:	Apply statistical tests in testing hypothesis on data (K3)
CO4:	Analyse data by utilizing various data mining approaches (K4)
CO5:	Build applications using business analytics tools (K3)

Part – A (5 × 2 = 10 Marks)

		KL	CO	PI
1.	Compare OLTP and OLAP	K1	CO1	1.3.1 1.4.1
2.	Outline the reasons why businesses need a Business Intelligence Reporting Tool.	K2	CO2	1.3.1 1.4.1
3.	It is believed that college students in New Delhi spend an average of 80 minutes daily on texting using their mobiles; the standard deviation is 25 minutes. Data from 100 students were selected to understand the time spent texting. Use probability concepts to calculate the probability of average time spent by this sample of students will exceed 84 minutes.	K3	CO3	1.3.1 1.4.1 13.3.1

4	A random sample of eight drivers was selected who insured with a company and having similar auto insurance policies. The following table lists their driving experiences (in years) and auto insurance premiums (in dollars). Make use of linear regression concept to compute *SSxx*, *SSyy*, *SSxy*.	K3	CO4	4.3.1 5.1.1
5.	Outline the use of Power Query.	K2	CO5	5.1.1

Driving Experience (Years)	5	2	12	9	15	6	25	16
Auto Insurance Premium (Dollars)	64	87	50	71	44	56	42	60

Part – B (5 × 6 = 30 Marks)

		KL	CO	PI
6.	Everyone visiting a retail company website gets one promotional offer or no offer. The GM of a retail company wants to see if making a promotional offer makes a difference in sales. As a data analyst of that company, list what kind of analytics you would recommend and state the reasons.	K2	CO1	1.3.1 1.4.1
7.	A manager of a chain of stores would like to use sales transactional data to analyze the effectiveness of a store's advertisements. In particular, he would like to study how specific factors influence the effectiveness of advertisements that announce a particular category of items on sale. The factors to study are the region where customers live, the day of the day-of-the-week and time-of- the-day of the ads. Identify an efficient method to mine the transaction data sets and explain how multidimensional and multilevel mining methods canhelp you derive a good solution.	K3	CO2	1.3.1 1.4.1

8.	Black boxes used in an aircraft are manufactured by three companies, A, B and C. 75% are manufactured by A, 15% by B, and 10% by C. The defect rates of black boxes manufactured by A, B, and C are 4%, 6%, and 8%, respectively. If a black box tested randomly is defective, apply Baye's theorem to find the probability that it is manufactured by company A.	K3	CO3	1.3.1 1.4.1 2.1.2
9.	The sales of the company for the years 1994 - 2001 are given below: Year: 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 Sales (Lakhs): 550 | 560 | 555 | 585 | 540 | 525 | 545 | 585 Apply a linear trend model and derive an equation to estimate the sales for 1993 and show whether the figures have a rising or falling trend.	K3	CO4	4.3.1 5.1.1 13.2.1
10.	Your manager asked you to create a dashboard that shows the performance of medical representatives(mr). One of the reporting requirements is to show the top and bottom 5 representatives based on the number of doctors visited (no_doc_visited). Make use of Tabulae expressions to write the code to configure the dashboard and explain the steps involved. [Fields available: mr, no_doc_visited]	K3	CO5	5.1.1

Part – C (5 × 12 = 60 Marks)

		KL	CO	PI
11.	a) Explain the typical OLAP operations applied on a multidimensional data model with a neat sketch. (4) b) Compare and contrast descriptive, predictive, and prescriptive analytics (8)	K2	CO1	1.3.1 1.4.1 2.1.2
	(Or)			
12.	a) How do you define inferential statistics and location statistics? (4) b) Explain how big data concepts are applied in healthcare in terms of characteristics and data analytic types. (8)	K2	CO1	1.3.1 1.4.1 2.1.2

13.	a) Explain the various steps in the Knowledge Discovery from Data (KDD) process. Justify that data mining is merely an essential step in this process. (7) b) With a neat sketch, explain the architecture of business intelligence. (5)	K2	CO2	1.3.1 1.4.1
	(Or)			
14.	a) State the need for dimensional modelling with an example. (5) b) Define the following terms related to dimensional modelling: i) Fact, ii) Dimensional Tables and iii) Dimension Models(schemas). (7)	K2	CO2	1.3.1 1.4.1
15.	A passport office claims that passport applications are processed within 30 days of submitting the application form and all necessary documents. The table below shows the processing time of 40 passport applicants. 16 16 30 37 25 22 19 35 27 32 34 28 24 35 24 21 32 29 24 35 28 29 18 31 28 33 32 24 25 22 21 27 41 23 23 16 24 38 26 28 The population standard deviation of the processing time is 12.5 days. Make use of a hypothesis test at significance level $\alpha = 0.05$ to verify the claim made by the passport office.	K3	CO3	1.3.1 1.4.1 2.1.2 13.3.1
	(Or)			

16. Flywell Airlines (FA) operates daily flights to several Indian cities. One of the problems FA faces is the food preferences of the passengers. Captain Cook, the operations manager of FA, believes that 35% of their passengers prefer vegetarian food, 40% prefer non-vegetarian food, 20% low-calorie food, and 5% request diabetic food. A sample of 500 passengers was chosen to analyse the food preferences, and the data is shown in the table below.

Food Type	Vegetarian	Non-Vegetarian	Low Calorie	Diabetic
No. of passengers	190	185	90	35

Apply a chi-square test to check whether Captain Cook's belief is true at α =0.05.

K3 | CO3 | 1.3.1, 1.4.1, 2.1.2, 13.3.1

(Or)

17. Apply Information gain as an attribute selection measure and identify the root node to build a Decision tree classifier for the given data set. Find the root node alone.

Patient ID	Age	Sex	BP	Cholesterol	Drug
P1	Young	F	High	Normal	A
P2	Young	F	High	High	A
P3	Middle Age	F	High	Normal	B
P4	Senior	F	Normal	Normal	B
P5	Senior	M	Low	Normal	B
P6	Senior	M	Low	High	A
P7	Middle Age	M	Low	High	B
P8	Young	F	Normal	Normal	A
P9	Young	M	Low	Normal	B
P10	Senior	M	Normal	Normal	B
P11	Young	M	Normal	High	B
P12	Middle Age	F	Normal	High	B
P13	Middle Age	M	High	Normal	B
P14	Senior	F	Normal	High	B
P15	Middle Age	F	Low	Normal	?

K3 | CO4 | 1.3.1, 4.3.1, 5.1.1, 14.4.2

<table>
<tr><td>18.</td><td>Consider the following transactional dataset D, containing TID and List of items_id. Find the frequent itemsets and generate association rules for them. Let min_sup be 50%.
<table>
<tr><th>TID</th><th>T1</th><th>T2</th><th>T3</th><th>T4</th><th>T5</th><th>T6</th><th>T7</th><th>T8</th><th>T9</th></tr>
<tr><td>List of Items Ids</td><td>I1,I2, I5</td><td>I2,I4</td><td>I2,I4</td><td>I1,I2,I4</td><td>I1,I3</td><td>I2,I3</td><td>I1,I3</td><td>I1,I2, I3,I5</td><td>I1,I2, I3</td></tr>
</table></td><td>K3</td><td>CO4</td><td>1.3.1
4.3.1
5.1.1</td></tr>
<tr><td colspan="5"></td></tr>
<tr><td>19.</td><td>a) With many business intelligence tools being offered, from small startups to big software vendors, deciding which tool to choose is a critical activity. Outline the points that help to finalize the choice of BI Tool. (5)
b) Compare Power BI vs Tableau vs IBM Cognos. (7)</td><td>K2</td><td>CO5</td><td>5.1.1
14.4.2</td></tr>
<tr><td colspan="5">(Or)</td></tr>
<tr><td>20.</td><td>a) Explain DAX and its importance for a data analyst. (5)
b) Explain the process of blending data in Tableau and list the steps to optimizethe performance in Tableau when working with large datasets. (7)</td><td>K2</td><td>CO5</td><td>5.1.1
14.4.2</td></tr>
</table>

Register Number | 3 | 1 | 2 | 2 | 2 | 1 | 5 | 0 | 0 | 1 | 0 | 6 | 6 |

Sri Sivasubramaniya Nadar College of Engineering, Kalavakkam – 603 110

(An Autonomous Institution, Affiliated to Anna University, Chennai)

Computer Science and Engineering

Continuous Assessment Test – I

Regulations – R2021

Degree & Branch	B.E. CSE				**Semester**	VI
Subject Code & Name	UCS 2H26 COMPUTER VISION					
Academic Year	2023-2024 ~~ODD~~/EVEN	**Batch**	2021-2025	**Date**	**25/03/2024**	~~FN~~ / AN
Time: 03:45 – 05:15 p.m (90 Minutes)	**Answer All Questions**				**Maximum: 50 Marks**	

(K1: Remembering, K2: Understanding, K3: Applying, K4: Analyzing, K5: Evaluating)

CO1:	Apply various low-level feature detection methods (K3)
CO2:	Apply various feature analysis methods and transforms for intermediate-level vision (K3)
CO3:	Explain depth estimation and 3D reconstruction (K2)
CO4:	Analyse different object recognition methods (K4)
CO5:	Analyse deep learning models for a real-time computer vision application (K4)

Part – A (4 × 2 = 8 Marks)

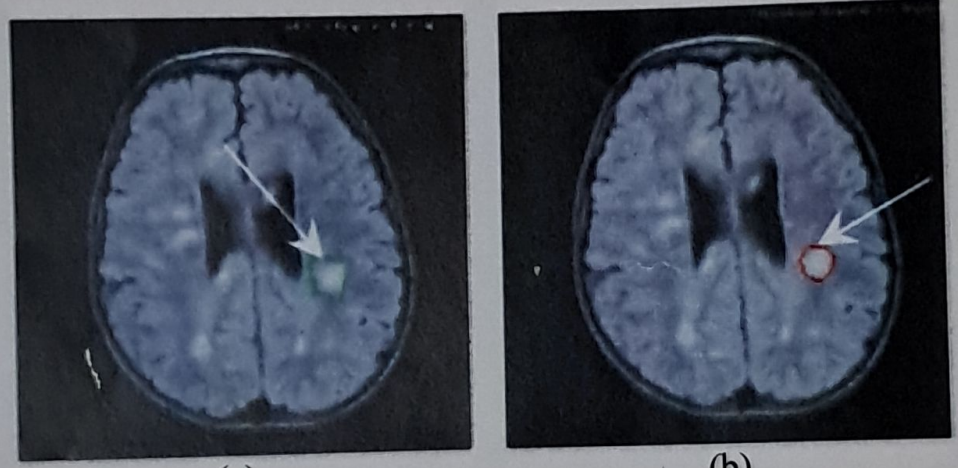
		KL	CO	PI
1.	Compare and contrast convex hull and convex deficiency.	K2	CO2	1.3.1
2.	Summarise the steps involved in Canny edge detector.	K2	CO1	1.3.1 2.1.3
3.	Explain the role of crossing number in skeletonization.	K2	CO2	2.1.3 2.2.3
4.	Define correspondence problem.	K2	CO3	1.4.1 2.1.3

Part – B (3×6 = 18 Marks)

		KL	CO	PI
5.	Compare and contrast 1st and 2nd derivative methods of local edge detection. What are the advantages and disadvantages of each?	K2	CO1	1.3.1 2.1.3
6.	Consider a scenario for designing wearable devices to monitor the gait patterns of elderly individuals or patients with mobility issues. The centroidal profile approach would enable	K3	CO2	2.1.3 2.2.3

	continuous monitoring of gait parameters and early detection of changes that may indicate health problems or increased fall risk. Identify the potential risks/ challenges/ problems in the centroidal profile approach for the above mentioned scenario.			
7.	Illustrate a scenario when two lenses are used to obtain a stereo pair of images.	K2	CO3	1.4.1 2.1.3

Part – C (2 × 12 = 24 Marks)
(Any subdivisions should be either 7+5 or 8+4)

		KL	CO	PI
8.	Consider the brain MR images given below. A suitable technique is applied and initially obtained the region (tumor) as marked in green color (as given in (a)). After several iterations, finally obtained the region as marked in red color (as given in (b)). Identify the technique applied and elaborate the steps involved.  (a) (b)	K3	CO1	2.1.3 13.3.1
	(Or)			
9.	Identify the technique the following pair of images ((a) and (b)) represent. Elaborate the problem that the technique solves and mention the steps involved.  (a) (b)	K3	CO1	2.1.3 13.3.1

B&W

10.	In autonomous vehicle navigation, consider a scenario where a self-driving car needs to detect circular road signs for effective traffic management. Identify and describe a suitable algorithm to detect road signs amidst varying lighting conditions, occlusions, and distortions caused by environmental factors such as rain or fog.	K3	CO2	2.2.3 13.3.1
	(Or)			
11.	In manufacturing industries such as automotive or consumer electronics, many components, such as gears, bearings, or connectors, have elliptical shapes. Identify and describe a suitable algorithm to detect elliptical shaped components amidst varying noise or defects.	K3	CO2	2.2.3 13.3.1

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Register Number | 3 | 1 | 2 | 2 | 2 | 1 | 5 | 0 | 0 | 7 | 0 | 6 | 6 |

Sri Sivasubramaniya Nadar College of Engineering, Kalavakkam – 603 110
(An Autonomous Institution, Affiliated to Anna University, Chennai)

Computer Science and Engineering

Continuous Assessment Test – II

Regulations – R2021

Degree & Branch	B.E. CSE				**Semester**	VI
Subject Code & Name	**UCS 2H26 COMPUTER VISION**					
Academic Year	2023-2024 ~~ODD~~/EVEN	**Batch**	2021-2025	**Date**	**06/05/2024**	~~FN~~ / AN
Time: 4:00 – 5:30 p.m (90 Minutes)	**Answer All Questions**				**Maximum: 50 Marks**	

(K1: Remembering, K2: Understanding, K3: Applying, K4: Analyzing, K5: Evaluating)

CO1:	Apply various low-level feature detection methods (K3)
CO2:	Apply various feature analysis methods and transforms for intermediate-level vision (K3)
CO3:	Explain depth estimation and 3D reconstruction (K2)
CO4:	Analyse different object recognition methods (K4)
CO5:	Analyse deep learning models for a real-time computer vision application (K4)

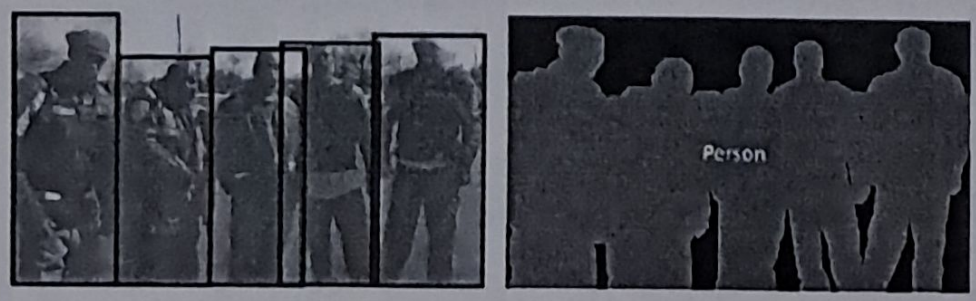
Part – A (4 × 2 = 8 Marks)

		KL	CO	PI
1.	Define bundle adjustment.	K1	CO3	1.3.1
2.	Compare and contrast the concepts of detection and recognition with suitable examples.	K2	CO4	1.3.1, 1.4.1
3.	Summarize context understanding and scene understanding.	K2	CO4	1.3.1, 2.1.3
4.	Describe visualization of kernels.	K2	CO5	1.4.1, 2.1.3

Part – B (3×6 = 18 Marks)

		KL	CO	PI
5.	Describe the process to reconstruct a 3D scene and simultaneously obtain the camera poses of a monocular camera with respect to a given scene.	K2	CO3	1.3.1, 2.1.3
6.	Design a suitable attendance tracking system by making use of a face detection algorithm. List down the various challenges involved during the design and identify the possible solutions.	K3	CO4	2.1.3, 4.1.2
7.	Explain the concept of "receptive field" used both in CNNs (Convolutional Neural Networks) and in visual neuroscience, and identify the role of trainable connections. Why is the concept of convolution relevant?	K2	CO5	1.4.1, 4.1.2

Part – C (2 × 12 = 24 Marks)
(Any subdivisions should be either 7+5 or 8+4)

		KL	CO	PI
8.	When visually inferring a 3D representation of a face, it is useful to extract separately both a shape model, and a texture model. Analyze the purposes of these steps, their use in morphable models for pose-invariant face recognition, and how the shape and texture models are extracted and later re-combined.	K4	CO4	4.1.2, 13.3.1
	(Or)			
9.	*"An image is worth a thousand words, each image has various components in it."* Analyze the purposes of identifying the various components (parts) in an image.	K4	CO4	4.1.2, 13.3.1
10.	Design a computationally efficient model for performing the following task. 	K4	CO5	2.2.3, 12.2.1, 13.3.1
	(Or)			

11.	Design a computationally efficient model for performing the following task.  	K4	CO5	2.2.3, 12.2.1, 13.3.1

Register No: | 3 | 1 | 2 | 2 | 2 | 1 | 5 | 0 | 0 | 1 | 0 | 6 | 6 |

Sri Sivasubramaniya Nadar College of Engineering, Kalavakkam – 603 110.

(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. / B.Tech. End Semester Theory Examinations, April / May 2024.

Sixth Semester

Computer Science and Engineering

UCS2H26 COMPUTER VISION

(Regulations 2021)

(Common to Chemical Engineering, Electrical and Electronics Engineering, Electronics and Communication Engineering and Bio Medical Engineering)

Time: **Three Hours** Maximum:**100 Marks**

K1: Remembering K2: Understanding K3: Applying K4: Analyzing K5: Evaluating

CO1:	Apply various low level feature detection methods
CO2:	Apply various feature analysis methods and transforms for intermediate level vision
CO3:	Explain depth estimation and 3D reconstruction
CO4:	Analyse different object recognition methods
CO5:	Analyse deep learning models for a real time computer vision application

Part – A (5 × 2 = 10 Marks)

		KL	CO	PI
1.	Compare and contrast computer vision and human vision.	K2	CO1	1.3.1
2.	What is the difference between thinning and skeletonizing?	K1	CO2	1.4.1 2.2.3
3.	How does feature-based alignment contribute to the process of image registration and 3D reconstruction?	K1	CO3	1.4.1
4.	Define Eigen faces and state their necessity.	K1	CO4	1.3.1 1.4.1
5.	Outline the concept of spatio-temporal models in the context of vision applications.	K2	CO5	1.3.1 1.4.1

Part – B (5 × 6 = 30 Marks)

		KL	CO	PI
6.	Mention the common strategies for selecting seed points in region growing methods. How does the choice of seed point selection strategy impact the effectiveness and efficiency of the segmentation process?	K3	CO1	1.1.1 2.1.3
7.	State the challenges involved in shape recognition and the techniques used to address them. Discuss the contribution of shape recognition algorithms in computer vision applications.	K2	CO2	2.1.3 2.2.3

8.	Utilize the concept of triangulation in the context of structure-from-motion (SfM) techniques to estimate the 3D structure of a scene from multiple 2D images. Discuss the key principles of triangulation, including the use of corresponding image points and camera parameters.	K3	CO3	1.4.1 2.1.3
9.	Explain the roles of data preprocessing, augmentation techniques, and model evaluation metrics in optimizing face detection algorithms for real-world scenarios.	K3	CO4	2.1.3 2.2.3
10.	Compare and contrast R-CNN, Fast R-CNN, and Faster R-ÇNN with suitable justification.	K2	CO5	2.1.3 2.2.3

Part – C (5 × 12 = 60 Marks)

		KL	CO	PI
11.	Analyze the mechanism of thresholding in image processing, focusing on both global and adaptive thresholding methods. Explain how thresholding is used to segment images by separating objects or features of interest from the background. (6M+6M)	K3	CO1	2.1.3 13.3.1
	(Or)			
12.	Explain the Canny edge detection algorithm and its significance in vision applications in a detailed step-by-step process. Highlight the advantages of the Canny edge detection algorithm compared to other edge detection techniques. Provide the examples of real-world applications where Canny edge detection is commonly used and discuss the factors influencing its effectiveness in different scenarios	K3	CO1	2.1.3 13.3.1
13.	Discuss the principles behind centripetal profile generation for boundary tracking and explain how centripetal profiles are used to track boundaries or contours of objects in images with the factors influencing their performance in different types of images and environments.	K4	CO2	2.2.3 4.1.2 13.3.1
	(Or)			
14.	Elaborate how the Hough Transform is used for detecting geometric shapes, particularly lines and circles, in digital images.	K4	CO2	2.2.3 4.1.2

	Describe the key steps involved in the Hough Transform algorithm. List any two real-life examples where Hough transform is utilized.			13.3.1
15.	Assess the importance of the epipolar geometry concept in stereo vision techniques. Determine the key components of epipolar geometry and justify their significance in computer vision by listing the sample tasks.	K3	CO3	1.3.1 2.1.3 13.3.1
	(Or)			
16.	Discuss the different variations of Shape from X and elaborate each variation in detail with the necessity of each. Also, identify the domains in which Shape from X plays a vital role.	K3	CO3	1.3.1 2.1.3 13.3.1
17.	Compare and contrast bag-of-words and part-based models in terms of their effectiveness, robustness, and computational complexity. Describe the key components and workflow of each approach.	K4	CO4	4.1.2 13.3.1
	(Or)			
18.	Discuss how learning from large image collections contributes to improving context and scene understanding algorithms. Describe the key challenges involved in context and scene understanding and discuss the potential benefits and limitations of these techniques.	K4	CO4	4.1.2 13.3.1
19.	Design the architecture of a neural network designed for backpropagation training with the key components and layers involved for computer vision. Elaborate on the role of parameters such as learning rate, batch size, and optimization algorithms in the training process.	K3	CO5	4.1.2 12.2.1 13.3.1
	(Or)			
20.	Judge the significance of CNN's and RNN's in video understanding for vision applications. Justify how they will be used for activity recognition in a simplified manner.	K3	CO5	4.1.2 12.2.1 13.3.1