2023-24
B. TECH. (AUTUMN SEMESTER) EXAMINATION
COMPUTER ENGINEERING
INFORMATION SECURITY
COC4010

Maximum Marks: 60   **Credits: 04**   **Duration: Two Hours**

Answer all questions.
Assume suitable data if missing.
Notations and symbols used have their usual meaning.

Q. No.	Question	CO	M.M.
1(a)	(a) What is the difference between security attacks, security mechanism and security services? (b) Differentiate between active and passive attacks.	(CO1)	[6+2]
	OR		
1(a')	What is cryptanalysis? Explain the cryptanalysis attacks.	(CO1)	[2+6]
1(b)	Explain the various cryptographic system categories with suitable examples.	(CO2)	[07]
2(a)	Using **Hill Cipher** compute the cipher text for the given plain text. Show all the steps $Key = \begin{bmatrix} 17 & 17 & 5 \\ 21 & 18 & 21 \\ 2 & 2 & 19 \end{bmatrix}$ Plain Text: "Pay more money".	(CO2)	[07]
2(b)	(a) Do we have the inverse of 10 in Z_{36} domain? Prove your answer. (b) Bob wants to send the following plain text to Alice. Compute the cipher text using RSA algorithm. **Plain Text = 88, P = 17, Q=23 and Public Key = 3.** Show all the steps to encrypt and decrypt the message using **fast exponential method.**	(CO2)	[2+6]
3(a)	(a) What is Role Based Access Control (RBAC)? Differentiate between Hierarchical RBAC and Constraint RBAC. (b) What is separation of duties (SoD)? Explain the idea behind using SoD in Role-based Access Control.	(CO4)	[5+2]
3(b)	Define Malware? Explain the following types of malwares: i. Virus ii. Worms	(CO4)	[2+6]

	iii. Trojan Horse iv. Spyware		
	OR		
3(b')	What is blended attack? Explain Advanced Persistent Threats.	(CO4)	[2+6]
4(a)	What is Public Key Infrastructure (PKI)? Explain the various components of PKI using Public Key Interaction diagram.	(CO3)	[2+6]
	OR		
4(a')	What is Pretty Good Privacy (PGP)? Explain all the steps and working of PGP use suitable diagram.	(CO3)	[2+6]
4(b)	(a) What is Intrusion Detection System (IDS)? Explain its types and their associate problems. (b) What is Base-Rate Fallacy? An IDS generates 100001000 log entries out of which 1000 corresponds to actual malicious events. This IDS has 2% chance of false positive and 1.5% chance of false negative. Find the rate of false alarms raised by the IDS?	(CO3)	[4+3]

2023-24
B. TECH. (ODD SEMESTER) EXAMINATION
COMPUTER ENGINEERING
COMPILER DESIGN
COC4060

Maximum Marks: 60   **Credits: 04**   **Duration: Two Hours**

Answer all questions.
Assume suitable data if missing.
Notations and symbols used have their usual meaning.

Q.No.	Question	CO	M.M.
1(a)	Compare the Call-By-Value and Call-By-Reference parameter passing technique. Take suitable examples to explain.	(CO1)	[7.5]
1(b)	Identify tokens and lexemes in the following C language code segment –	(CO2)	[7.5]

$\#define\ SQR(x)\ (x * x)$

$printf\ (\ "Area\ is\ \%f\ ",\ 3.14 * SQR(radius)\ );$

What action is taken by lexical analyser when it recognizes an identifier?

2(a)	Construct a SLR parsing table for the following grammar, deriving expressions consisting of addition (+) and exponential (^) operators –	(CO2)	[7.5]

$$E \quad \rightarrow \quad E + E \quad | \quad E \wedge E \quad | \quad id$$

Remove conflicts in the parsing table by using operator precedence and associativity.

2(b)	Define the followings –	(CO3)	[7.5]

- Handle
- Viable Prefix
- Inherited Attribute

OR

2'(a)	Construct a predictive parsing table after eliminating left recursion for the following grammar -	(CO2)	[7.5]

$$E \rightarrow E + E \quad | \quad E * E \quad | \quad id$$

2'(b) Consider the following binary arithmetic operators # (returns minimum of two operands) and $ (returns maximum of two operands). Both the operators have equal precedence and are left-to-right associative. Design a syntax directed translation scheme which accepts an expression (consisting of #, $ and single digit operand) and evaluates it. For example, the expression 3#2#5$1 evaluates to 2, the expression 3#7$5#8 evaluates to 5.   (CO3)   [7.5]

3(a) List different forms or types of three address instructions.   (CO1)   [7.5]

3(b) Translate the following to three address code using any syntax directed translation scheme –   (CO2)   [7.5]

while (a<b) while(a<d) if (c<a && c<d) a = a+c;
b = a+c;

OR

3'(a)(i) Give type expressions for *node, info* and *calc* in the following C language declarations –   (CO1)   [7.5]

*struct node { int data; struct node * next; } info[20];*
*int *calc (struct node *);*

(ii) Give syntax directed scheme for type checking of the *mod* expression and *if-then* statement.

3'(b) Consider the statement *iffalse* whose syntax and semantics are: (CO2)   [7.5]

iffalse (B) then S_1 else S_2
iffalse (B) then S_1

S_1 executes when boolean expression B is false otherwise S_2 executes. Give a syntax directed translation scheme to translate above to three address code.

4(a) What is reaching definition analysis? Give its dataflow equation? When a definition is said to be generated and killed by a block?   (CO1)   [7.5]

4(b) Give definition of back edge. How are loops and their bodies identified in a flow graph? Explain with a suitable example.   (CO2)   [7.5]

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2023-2024
B. TECH. (AUTUMN SEMESTER) EXAMINATION
(COMPUTER ENGINEERING)
INTERNET TOOLS
COE-4310

Maximum Marks: 60   **Credits: 04**   **Duration: Two Hours**

Answer all questions.
Assume suitable data if missing.
Notations and symbols used have their usual meaning.

Q.No.	Question	CO	M.M.
1(a)	What is the World Wide Web Consortium (W3C)? Briefly discuss the five basic levels of W3C standards.	(CO2)	[7.5]
1(b)	What is Firewall? How it acts as a packet filter? Differentiate between stateless and stateful packet filter firewall?	(CO2)	[7.5]

OR

1(b')	Why do we need name-address resolution in DNS? Discuss briefly the iterative resolution technique for name-address resolution in DNS with suitable diagram.	(CO2)	[7.5]
2(a)	For what purpose Simple Network Management Protocol (SNMP) is used? Construct the SNMP PDU for the following request: Request type = GetBulk, Non-repeaters = 2, Max-repetition = 5 Variable 1, Variable 2, Variable 3. Also give the response PDU.	(CO1)	[7.5]

OR

2(a')	Apply Basic Encoding Rules (BER) method used in SMI to encode the following data: I. *INTEGER 235* II. *OCTET STRING "HELLO"* III. *IPAddress 128.19.24.54*	(CO1)	[7.5]

2(b) Explain the services provided by the User Datagram Protocol (UDP). How   (CO1)   [7.5]
UDP provides error detection?

3(a) With the help of suitable diagram, explain how clients are served by   (CO2)   [7.5]
Connectionless Iterative Server.

3(b) Explain the client-server concurrent communication using TCP with the   (CO1)   [7.5]
help of socket calls flow diagram.

OR

3(b') Explain any **three** of the following functions giving their prototype: (CO1)   [7.5]

    I.   *Socket* function

    II.   *Bind* function

    III.   *Connect* function

    IV.   *Listen* function

4(a) Apply Columnar Transposition Cipher to encrypt the plaintext "life is like a   (CO3,4)   [7.5]
journey" with encryption key as 3 1 4 5 2. Obtain the decryption key and
also decrypt the obtained cipher text.

4(b) Explain the process of RSA cryptosystem. Apply the process to encrypt the   (CO3,4)   [7.5]
message "HI" with the chosen values of **p, q,** and **e** as 7, 11, and 13
respectively.

2023-24
B. TECH. (AUTUMN SEMESTER) EXAMINATION
COMPUTER ENGINEERING
NATURAL LANGUAGE PROCESSING
COE4620

Maximum Marks: 60   **Credits: 04**   **Duration: Two Hours**

Answer all questions.
Assume suitable data if missing.
Notations and symbols used have their usual meaning.

Q.No.	Question	CO	M.M.
1(a)	What is the fundamental concept of ontology within the realm of computer science and how does it play a pivotal role in knowledge representation, data integration, and semantic understanding?	(CO1)	[06]
1(b)	What are the four main classes of words, provide suitable examples for each class to illustrate their distinct linguistic functions?	(CO1,CO2)	[09]

OR

1(b')	Consider the following toy example:	(CO1,CO3)	[09]

Training data:

\<s\> I am Sam \</s\>

\<s\> Sam I am \</s\>

\<s\> Sam I like \</s\>

\<s\> Sam I do like \</s\>

\<s\> do I like Sam \</s\>

Assuming bigram language model for the above training data, find the most probable next word predicted by the model for the following word sequences?

    a.   \<s\> Sam . . .

    b.   \<s\> Sam I do . . .

    c.   \<s\> Sam I am Sam . . .

2(a)	What is transformer learning? Elaborate on transformation-based tagging, including its three stages?	(CO3)	[7.5]

2(b) What is the definition and purpose of Word Sense Disambiguation (WSD)   (CO3)   [7.5]
in natural language processing? Discuss different approaces for it. How
does it contribute to the improvement of language understanding and
machine learning applications?

3(a) Perform Anaphora Resolution Procedure using Lappin and Leass's   (CO3)   [7.5]
Salience values for the following sentences:

Niall Ferguson is prolific, well-paid and a snappy dresser. Stephen Moss

*hated **him**, at least until **he** spent an hour being charmed in the historian's*

Oxford study.

3(b) Define and illustrate the concept of hyponymy in WordNet. Provide   (CO2)   [7.5]
examples to demonstrate how hyponyms are structured within a lexical
hierarchy.

4(a) How effective do you find word embeddings in capturing the semantic   (CO4)   [7.5]
meaning of words? Briefly describe different word embeddings (dense
vectors).

4(b) Discuss text summarization and differentiate abstractive and extractive   (CO4)   [7.5]
summarization with suitable examples and/or diagrams.

OR

4'(a) Examine sentiment analysis and explore its various types. What challenges   (CO4)   [7.5]
are associated with it?

4'(b) Explain the concept of machine translation. Discuss different types of   (CO4)   [7.5]
approached to it.

2023-24
B. TECH. (AUTUMN SEMESTER) EXAMINATION
COMPUTER ENGINEERING
DATA MINING
COE 4630

Maximum Marks: 60   **Credits: 04**   **Duration: Two Hours**

Answer all questions.
Assume suitable data if missing.
Notations and symbols used have their usual meaning.

Q.No.	Question	CO	M.M.
1(a)	With the help of suitable examples, briefly explain the various proximity measures used in data mining.	(CO1)	[08]
1(b)	What do you understand by data preprocessing? Discuss briefly the various techniques of data preprocessing.	(CO1)	[07]

OR

1(b')	What is Principal Component Analysis? Why is it used? Write the steps involved in PCA.	(CO1)	[07]

2(a)	Apply the Apriori algorithm on the transaction data given below with support threshold of 33.34% and confidence threshold of 60%. Enumerate all the final frequent itemsets. Also indicate the association rules that are generated and highlight the strong ones.	(CO2)	[08]

Transaction ID	Items
T1	A, B, K
T2	A, B
T3	A, C, D
T4	C, D
T5	D, K
T6	A, C, D

2(b)	Consider the following set of candidate 3-itemsets: {a, b, c}, {a, b, d}, {a, b, e}, {a, c, d}, {a, c, e}, {a, c, f}, {a, d, e}, {b, c, d}, {b, c, e}, {b, c, f}, {b, d, e}, {b, e, f}, {c, d, e}, {c, e, f}.	(CO2)	[07]

a) Construct a binary hash tree for storing the above 3-itemsets. Assume the hash tree uses a hash function where items a, d are hashed to the left child of a node, items b, e are hashed to the middle child, while items c, f are hashed to the right child. A candidate k-itemset is inserted into the tree by hashing on each successive item in the candidate. Assume maximum size of the leaf node is 2 if the depth of leaf node is less than k and no restriction otherwise. (The root node is assumed to be at depth 0).

b) Consider a transaction that contains items {a,b,d,e,f}. List all the leaf nodes in the hash tree to which the transaction will be hashed into.

OR

2(b') List and explain any five measures for evaluation of association patterns. Also discuss their pros and cons.   (CO2)   [07]

3(a) Consider the following training set, which contains 3 binary attributes X_1, X_2, and X_3. There are 50 examples in the training set, with equal number of positive and negative examples.   (CO3)   [08]

X_1	X_2	X_3	Number of positive training examples	Number of negative training examples
1	1	1	5	0
1	0	1	10	10
0	0	1	5	5
0	1	1	0	10
0	0	0	5	0

Build a Naïve Bayes Classifier from the above training set and compute the training error rate of the classifier.

3(b) Consider the one-dimensional data set shown in Table below: (CO3)   [07]

x	0.5	3.0	4.5	4.6	4.9	5.2	5.3	5.5	7.0	9.5
y	–	–	+	+	+	–	–	+	–	–

Classify the data point $x = 5.0$ according to its 1-, 3-, 5-, and 9-nearest neighbors using
   a) Majority vote
   b) Distance-weighted voting approach.

OR

3(b') What do you understand by supervised learning? Discuss the procedure for model selection and evaluation for a given dataset.   (CO3)   [07]

4(a) Consider the following set of one-dimensional points: (CO4)   [08]

{0.1, 0.2, 0.45, 0.55, 0.8, 0.9}

All the points are located in the range between [0,1]. Suppose we apply k-means clustering to obtain three clusters, A, B, and C. If the initial centroids are located at {0, 0.4, 1}, respectively, show the cluster assignments (A, B or C) and locations of the centroids after the first three iterations by filling out the following table. Also calculate the sum of squared error (SSE) after the third iteration.

Iter	Cluster assignment of data points						Centroid Locations		
	0.10	0.20	0.45	0.55	0.80	0.90	A	B	C
0	-	-	-	-	-	-	0.00	0.40	1.00
1									
2									
3									

4(b) Use the distance matrix given below to perform single and complete link (CO4) [07] hierarchical clustering. Show your results by drawing a dendrogram.

	p1	p2	p3	p4	p5
p1	0	0.5840	0.1955	0.3815	0.1127
p2	0.5840	0	0.6132	0.4956	0.5733
p3	0.1955	0.6132	0	0.2390	0.3067
p4	0.3815	0.4956	0.2390	0	0.4694
p5	0.1127	0.5733	0.3067	0.4694	0

OR

4(b') Write short notes on the following: (CO4) [07]
   i. DBSCAN
   ii. Cluster evaluation measures

2023-2024
B. TECH. (AUTUMN SEMESTER) EXAMINATION
(COMPUTER ENGINEERING)
APPLIED MACHINE LEARNING
COE-4640

Maximum Marks: 60   **Credits: 04**   **Duration: Two Hours**

Answer all questions.
Assume suitable data if missing.
Notations and symbols used have their usual meaning.

Q.No.	Question	CO	M.M.
1(a)	Write a note on linear regression. Please cover uses, loss equation, and derivative of the loss equation in your note.	(CO1)	[08]
	OR		
1(a')	Write a note on logistic regression. Please cover uses, loss equation, and derivative of the loss equation in your note.	(CO1)	[08]
1(b)	Describe various variations of Gradient Descent algorithm.	(CO1)	[07]
2(a)	Describe any three applications of Neural Networks in the industry.	(CO2)	[06]
2(b)	Describe any three activation functions.	(CO2)	[09]
	OR		
2(b')	Describe Multi-layer Perceptron, their application and write forward and back propagation equations for a Multi-layer Perceptron.	(CO2)	[09]
3(a)	Describe RNNs, their applications and write their forward propagation and loss equations.	(CO2)	[07]
	OR		
3(a')	Describe LSTMs, their applications, and write their forward propagation equations.	(CO2)	[07]
3(b)	Write a detailed note on GloVe embeddings.	(CO3)	[08]
4(a)	Create a diagram for describing the overall system design of a large-scale ML system.	(CO4)	[07]
	OR		
4(a')	Write a note on how embeddings can be trained using a TTSN architecture.	(CO4)	[07]
4(b)	Create a diagram showcasing all stages in a multi-stage ranking pipeline. Describe any two stages.	(CO4)	[08]