

Time: 3 Hours

Marks: 80

Note:- 1. Q1 is compulsory.

2. Solve any 3 question from remaining questions.

Q1 Attempt any 4

- a) Define software engineering. Explain umbrella activities of software engineering. (5)
- b) List out Requirement models. Explain any one of them. (5)
- c) What is cost estimation? Explain LOC method. (5)
- d) Illustrate design Principles. (5)
- e) Explain Walkthrough. (5)
- f) Differentiate between White Box and Black Box Testing. (5)

- Q 2 a) Discuss different categories of risk that help to define impact values in a risk table. (10)
b) Explain software reverse engineering in detail. (10)

- Q3 a) Explain cyclomatic complexity. How is it computed? (10)
b) What are the different testing types? Explain glass path testing gin detail. (10)

- Q4 a) Elaborate COCOMO method of cost estimation. (10)
b) What is FTR? Explain review guidelines considered during FTR. (10)

- Q5a) What is maintenance? Explain the steps for creating the maintenance log . (10)
b) What are Agile methodologies? Explain any one of them. (10)

- Q6 a). Explain Coupling and Cohesion? Explain the types of cohesion with example. (10)
b) Illustrate SCM Process. (10)

(3 hours)

Total marks: 80

- N.B
- 1) Question no 1 is compulsory
 - 2) Attempt any **three** questions from remaining five questions
 - 3) Assume suitable data if required
 - 4) Draw neat diagram wherever necessary

Q.1 Answer any **Four**

- a) Why digital signature and digital certificates are required? (05)
- b) Explain with example keyed and keyless transposition cipher (05)
- c) Explain key rings in PGP? (05)
- d) What are properties of hash function? Explain role of hash function in security (05)
- e) Using Chinese remainder theorem solve the following: (05)
 $x \equiv 2 \pmod{3}$, $x \equiv 3 \pmod{5}$, $x \equiv 2 \pmod{7}$, Find x ?

- Q.2 a) If A and B wish to use RSA to communicate securely. A chooses public key (e, n) as (7, 247) and B chooses public key (e, n) as (5, 221) (10)
- i. Calculate A's Private key.
 - ii. Calculate B's Private Key.
 - iii. What will be the cipher text sent by A to B, if A wishes to send $M=5$ to B
- b) What is meant by DOS Attack? What are different ways mount DOS attacks? (10)

- Q.3 a) How does ESP header guarantee confidentiality and integrity of packet payload? (10)
- b) Explain structure of DES wrt: (10)
- i. Feistel structure and its significance
 - ii. Significance of extra swap between left and right half blocks
 - iii. Expansion
 - iv. Significance of S-box
 - v. DES function

- Q.4 a) What is the need of SSL? Explain SSL Handshake Protocol (10)
- b) Encrypt the given message using Autokey Cipher, Key=7 and the Message is: (10)
 "The house is being sold tonight".

- Q.5 a) Explain man in the middle attack on Diffie Hellman . Explain how to overcome the same. (10)
- b) Use the playfair cipher with the keyword: "HEALTH" to encipher the message "Life is full of Surprises" (10)

- Q. 6 a) Explain Kerberos in detail (10)
- b) What are different types of firewall? How firewall is different than IDS? (10)

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N.B: (1) Question No. 1 is compulsory**(2) Attempt ant three questions out of remaining five questions**

- Q.1** (a) Enlist the different types of errors that are handled by Pass I and PassII of assembler. [05]
- (b) Define Loader. What are different functions of loader. [05]
- (c) Compare bottom up and top down parser. [05]
- (d) What is the need of Intermediate code generation? Explain any two Intermediate code generation forms with example [05]
- Q.2** (a) What is Left factoring? Find FIRST & FOLLOW for the following grammar [10]
 $S \rightarrow Aa$
 $A \rightarrow B D$
 $B \rightarrow b \mid \epsilon$
 $D \rightarrow d \mid \epsilon$
- (b) What are the phases of compiler? Give working of each phase for the Following statements:- [10]
 $\text{int } a, b, c = 1 ;$
 $a = a * b - 5 * 3 / c ;$
- Q.3** (a) Explain YACC in detail. [10]
- (b) Explain machine independent code optimization techniques. [10]
- Q.4** (a) Compare Compiler with Interpreter. [05]
- (b) Define left recursion? Eliminate left recursion from the following grammar [05]
 $S \rightarrow (L) \mid x$
 $L \rightarrow L, S \mid S$
- (c) Explain dynamic linking loader in detail. [10]
- Q.5** (a) Explain with flowchart design of two pass assembler. [10]
- (b) Explain with example conditional macro expansion. [10]
- Q.6** (a) Explain different assembler directives with example. [10]
- (b) Write short note on any two of the following: [10]
 i) Syntax directed translation
 ii) Code generation issues
 iii) Operator precedence parsing

(3 Hours)

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- N.B. : (1) Question No. 1 is compulsory.
 (2) Attempt any three questions out of remaining five.

- 1 (a) Define Machine Learning and Explain with example importance of Machine Learning [05]
- (b) Explain Multilayer perceptron with a neat diagram [05]
- (c) Why is SVM more accurate than logistic regression? [05]
- (d) Explain Radial Basis Function with example. [05]

2. (a) What is Dimensionality reduction? Describe how Principal Component Analysis is carried out to reduce dimensionality of data sets. [10]
- (b) Find the singular value decomposition of [10]

$$A = \begin{bmatrix} 2 & 2 \\ -1 & 1 \end{bmatrix}$$

- 3 (a) For a unknown tuple $t = \langle \text{Outlook} = \text{Sunny}, \text{Temperature} = \text{Cool}, \text{Wind} = \text{Strong} \rangle$ use naïve Bayes classifier to find whether the class for PlayTennis is yes or no. The dataset is given below [10]

Outlook	Temperature	Wind	PlayTennis
Sunny	Hot	Weak	No
Sunny	Hot	Strong	No
Overcast	Hot	Weak	Yes
Rain	Mild	Weak	Yes
Rain	Cool	Weak	Yes
Rain	Cool	Strong	No
Overcast	Cool	Strong	Yes
Sunny	Mild	Weak	No
Sunny	Cool	Weak	Yes
Rain	Mild	Weak	Yes
Sunny	Mild	Strong	Yes
Overcast	Mild	Strong	Yes
Overcast	Hot	Weak	Yes
Rain	Mild	Strong	No

- (b) List some advantages of derivative-based optimization techniques. Explain Steepest Descent method for optimization. [10]

4. (a) Given the following data for the sales of car of an automobile company for six consecutive years. Predict the sales for next two consecutive years. [10]

Years	2013	2014	2015	2016	2017	2018
Sales	110	100	250	275	230	300

- (b) Explain various basic evaluation measures of supervised learning Algorithm for Classification. [10]
5. (a) Consider following table for binary classification. Calculate the root of the decision tree using Gini index. [10]

Customer Income	Gender	Car Type	Class
High	M	Family	C1
High	M	Sports	C1
High	M	Family	C2
Low	M	Family	C2
Low	F	Family	C2
Low	F	Sports	C1
Low	F	Sports	C2
High	M	Family	C1
High	F	Family	C2
High	F	Family	C2
High	F	Sports	C2
Low	M	Sports	C2
Low	F	Family	C2
Low	M	Sports	C1

- (b) Define Support Vector Machine. Explain how margin is computed and optimal hyper-plane is decided. [10]
6. Write Short notes on any **four** [20]
- (a) Hidden Markov Model
 - (b) EM Algorithm
 - (c) Logistic Regression
 - (d) McCulloch-Pitts Neuron Model
 - (e) DownHill simplex method.

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N.B

- 1 Question 1 is compulsory.
- 2 Attempt any 3 questions out of the remaining questions
- 3 Assume Suitable data.

Q1	Any 4	05
a)	Compare IPV4 and IPV6	05
b)	Compare OSPF and RIP	05
c)	Compare Interior BGP with Exterior BGP	05
d)	Compare integrated and Differentiated service	05
e)	Compare RTP with RSVP protocols	05
Q2	a) Explain the ATM architecture in detail giving the need for adaptation layer.	10
	b) Explain the SDH/SONET Frame format	10
Q3	a) Explain x.25 protocol in detail	10
	b) Explain joining and exiting group using IGMP protocol	10
Q4	a) Explain M/M/1 queuing model with Little's Formula	10
	b) Explain Design parameters for Peak, delay or latency, availability and reliability	10
Q5	a) Explain MPLS with illustration, giving details of use of Label Distribution Protocol	10
	b) Explain SNMP protocol and the MIB structure for objects	10
Q6	Any 2	20
a)	Transmission Hierarchy	
b)	Session Control Protocol H.323	
c)	LANE	
d)	X.75	

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Note: 1. Question 1 is compulsory

2. Answer any three out of remaining five questions.

3. Assume any suitable data wherever required and justify the same.

Q1 a) Why is data integration required in a data warehouse, more so than in an operational application? [5]

b) Describe the steps involved in Data Mining when viewed as a process of knowledge Discovery. [5]

c) A dimension table is wide, the fact table is deep. Explain [5]

d) Elucidate Market Basket Analysis with an example. [5]

Q2 a) Suppose that a data warehouse consists of the three dimensions time, doctor and patient, and the two measures count and charge, where charge is the fee that a doctor charges a patient for a visit. [10]

(i) Draw a star schema diagram for the above data warehouse.

(ii) Starting with the base cuboid [day, doctor, patient], what specific OLAP operations should be performed in order to list the total fee collected by each doctor in 2010?

(iii) To obtain the same list, write an SQL query assuming the data are stored in a relational database with the schema fee (day, month, year, doctor, hospital, patient, count, charge).

b) Develop a model to predict the salary of college graduates with 10 years of work experience using linear regression. [10]

Years of experience (x)	Salary in \$100 (y)
3	30
8	57
9	64
13	72
3	36
6	43
11	59
21	90
1	20
16	83

Q3 a) Suppose that the data for analysis includes the attribute salary. We have the following values for salary (in thousands of dollars), shown in increasing order: 30, 36, 47, 50, 52, 52, 56, 60, 63, 70, 70, 110. [10]

(i) What are the *mean*, *median*, *mode* and *midrange* of the data?

(ii) Find the *first quartile* (Q1) and the *third quartile* (Q3) of the data.

(iii) Show a *boxplot* of the data.

- b) Why is entity-relationship modeling technique not suitable for the data warehouse? [10]
How is dimensional modeling different?

- Q4 a) Why is tree pruning useful in decision tree induction? What is a drawback of using a separate set of tuples to evaluate pruning? [10]

- b) Consider the transaction database given below, [10]

TID	Items
10	1, 3, 4
20	2, 3, 5
30	1, 2, 3, 5
40	2, 5
50	1, 3, 5

Use Apriori Algorithm with min-support count = 2 and min-confidence = 60% to find all frequent itemsets and strong association rules.

- Q5 a) Show the dendrogram created by the complete link clustering algorithm for the given set of points. [10]

	A	B
P1	2	4
P2	8	2
P3	9	3
P4	1	5
P5	8.5	1

- b) What is spatial data? Explain CLARANS Extension. [10]

- Q6 a) Demonstrate Multidimensional and Multilevel Association Rule Mining with suitable examples. [10]

- b) What is Web Structure Mining? List the, approaches used to structure the web pages to improve on the effectiveness of search engines and crawlers. Explain Page Rank technique in detail. [10]
