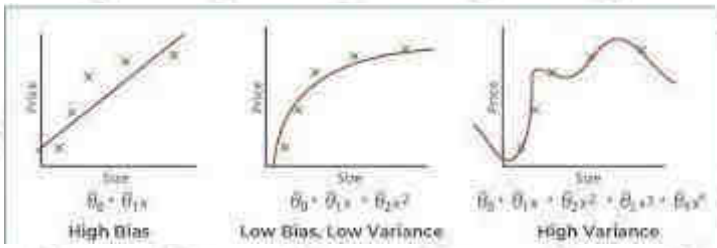
Duration: 3hrs **[Max Marks: 80]**

N.B. : (1) Question No 1 is Compulsory.
(2) Attempt any three questions out of the remaining five.
(3) All questions carry equal marks.
(4) Assume suitable data, if required and state it clearly.

1 Attempt any FOUR [20]

a With reference to below figure 1,2,3 explain under-fitting and over-fitting. Identify best fit and overfitted line. [5]



b 200 emails that were actually spam were correctly predicted as spam. 50 emails that were actually spam were incorrectly predicted as not spam. 60 emails that were actually not spam were incorrectly predicted as spam. And 330 emails that were actually not spam were correctly predicted as not spam. For the given data build the confusion matrix and find accuracy, precision, recall and f1 score. [5]

c In a SVM explain the kernel trick. [5]

d Draw and explain a biological neuron. Compare ANN with BNN. [5]

e What is curse of dimensionality? [5]

2 a Find the eigenvalues of the 2 x 2 matrix [10]

$$A = \begin{bmatrix} 0 & -2 \\ 3 & 4 \end{bmatrix}$$

Also find eigen vectors

b Diagonalize the matrix [10]

2	0	2
-1	2	1
0	1	4

[10]

3 a Find the values of a and b to estimate the **linear regression equation** (y= a+bx) for the following two sets of data:

x	2	4	6	8
y	3	7	5	10

b Explain the need for regularization. Compare Lasso and Ridge Regression techniques for regularization. [10]

4 a State the **algorithm** for Hebb learning rule. Design Hebb network for **AND gate**. State weights and bias assumptions clearly. Assume bipolar inputs and targets. [10]

b Explain the Expectation Maximization algorithm with neat flowchart. [10]

5 a Explain various activation functions with appropriate diagrams, equations, ranges and their applications in real world. [10]

b Explain back error propagation with neat diagram and weight Updation equation. [10]

6 a Implement OR function using single layer perceptron upto 2 epochs. Assume initial values of weights and learning rate as follows w1=w2=b=0 threshold (Θ) =0.2 and learning rate (α) = 1. [10]

b Use Principal component analysis to arrive at the transformed matrix for the given data [10]

2	1	0	-1
4	3	1	0.5

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N.B. (1) Question one is Compulsory.
(2) Attempt any 3 questions out of the remaining.
(3) Assume suitable data if required.

Q. 1 Answer any 4

a) What is cohesion and coupling 05
(b) Compare Agile and waterfall models 05
(c) Compare FTR and walkthroughs. 05
(d) What is the golden rule for User interface Design 05
(e) What are different umbrella activities 05

Q.2 a) Explain Design concepts and elaborate Architectural Design styles . 10
b) Discuss different categories of risk and You are the project manager for a major software company. You have been asked to lead a team that's developing "next generation" word processing software. Create a risk table for the project. 10

Q. 3 a) Elaborate COCOMO Method of cost estimation. 10
b) Write Test cases for input box accepting numbers between 1 and 1000 using Equivalence Partitioning and using Boundary Value Analysis. 10

Q.4 a) What is the importance of requirement analysis? Explain different Requirement engineering tasks. 10
b) Explain Software Change management with example. 10

Q. 5 a) Explain with diagram CMM model 10
b) Draw AON diagram and find the critical path. Find the total float time for each path and list down the critical and non-critical activities. Find the total duration of the project? 10

Activity	**Predecessor activity**	**Duration(days)**
A	None	2
B	A	4
C	A	3
D	B	2
E	C	3
F	D	6
G	D	5
H	F,G,E	4

Q.6 Write Short notes on . 20
i. Software Quality and quality factors
ii. PMBOK Knowledge Areas
iii. Kanban model and extreme programming
iv. Reverse engineering and reengineering

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Note:
1. Question 1 is compulsory.
2. Attempt any 3 questions out of the remaining questions.

Q1. Attempt any Four.

a. Explain different types of phishing techniques 05

b. Explain different mechanisms to achieve security. 05

c. Differentiate MD5 and SHA-1 algorithms. 05

d. Explain the different modes of block ciphers. 05

e. List and explain security requirements of database. 05

Q2.

a. Explain RSA algorithm with example. 10

b. List the functions of the different protocols of SSL. Explain the handshake protocol. 10

Q3.

a. List different poly-alphabetic substitution ciphers. Encrypt "The key is hidden under the door" using playfair cipher with keyword "domestic". 10

b. Explain memory and address protection in detail. Write a note on file protection. 10

Q4.

a. Define digital signature. Explain any digital signature algorithm in detail. 10

b. Explain session hijacking and management 10

Q5.

a. Give the format of X.509 digital certificate and explain the use of a digital signature in it. 10

b. What is need of Diffie-Hellman algorithm? Explain the algorithm with example. 10

Q6. Attempt any TWO.

a. List and explain characteristics needed in secure hash function. Compare various hash in detail. 10

b. Explain Triple DES in detail. 10

c. Explain Hill cipher with example. 10

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Time: 3 hours **Max. Marks: 80**

N.B. (1) Question one is Compulsory.
(2) Attempt any 3 questions out of the remaining.
(3) Assume suitable data if required.

Q1. Attempt the following (any 4): **[20]**

a. What are the application and use cases for text mining?
b. What is Seaborn Library? State and explain key features of seaborn.
c. Explain TFIDF with an example.
d. Explain Logistic Response Function.
e. List and explain the various key roles for a successful analytics.

Q2. Attempt the following **[20]**

a. Calculate the linear regression using least square method for the given dataset.

Independent Variable (X)	Dependent Variable (Y)
1	2
2	4
3	5
4	4
5	5

b. List and explain the different type of data visualization used in R.

Q3. Attempt the following: **[20]**

a. Explain the data analytics life cycle.
b. Explain AR and MA model in detail.

Q4. Answer the following **[20]**

a) Fit a regression equation to estimate β_0, β_1 and β_2 to the following data of a transport company on the weights of 6 shipments, the distances they were moved and the damage of the goods that was incurred.

Weight X_1 (1000 kg)	4.0	3.0	1.6	1.2	3.4	4.8
Distance X_2 (100 km)	1.5	2.2	1.0	2.0	0.8	1.6
Damage(y)	160	112	69	90	123	186

Estimate the damage when a shipment of 3700 kg is moved to a distance of 260 km.

b) Describe in detail about building and evaluating an ARIMA Model.

Q5. Attempt the following **[20]**

a) List and explain the steps in text analysis.
b) Describe in detail about removing the dirty data using R.

Q.6 Write short notes on: **[20]**

a) Box Plot
b) Data types in R
c) Box-Jenkins Methodology
d) Fitted value and residuals in Linear Regression.
