

(3 Hours)

(Total Marks: 80)

- N.B.:**
1. Question No. 1 is compulsory.
  2. Answer any three out of the remaining questions.
  3. Assume suitable data if necessary.
  4. Figures to the right indicate full marks.

**Q1. Attempt any FOUR** [20]

- [A] List and explain different key roles for successful data analytics?
- [B] What is Stepwise regression? Explain its types.
- [C] Explain Term Frequency-Inverse Document Frequency (TF-IDF) with a suitable example.
- [D] Difference between Matplotlib and Seaborn library.
- [E] Explain components of time series?

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

- [A] Explain different phases in data analytics lifecycle.
- [B] Explain ARIMA model in detail. Also state its Pros and Cons.

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

- [A] Explain in detail seven practice areas of text analytics.
- [B] Explain different types of data visualisation in Python programming language.

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

- [A] The number of bacterial cells (y) per unit volume in a culture at different hours (x) is given below:

<b>x</b>	0	1	2	3	4	5	6	7	8	9
<b>y</b>	43	46	82	98	123	167	199	213	245	272

Fit lines of regression of y on x and x on y. Also, estimate the number of bacterial cells after 15 hours.

[B] How Exploratory Data Analysis (EDA) is performed in R?

**Q5. Attempt the following**

**[20]**

[A] Enlist and explain the steps of text analysis.

[B] What is Logistic Regression? What are the similarities and differences between linear regression and logistic regression?

**Q6. Write short notes on:**

**[20]**

[A] Box-Jenkins Methodology

[B] Generalized Linear Model

[C] Pandas library

[D] Data import and export in R

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Time: 3 Hrs

Marks: 80.

Note:

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

Q1. Attempt any Four.

- a. Define the security Mechanisms and attacks for OSI security architecture. 05
- b. List various types of security that are applied on database. 05
- c. Define web security. Explain the role of cookies. 05
- d. Explain the different types of firewalls and layer in which it operate. 05
- e. Explain the different modes of block ciphers. 05
- f. Differentiate between Digital signature and digital certificate. 05

Q2.

- a. Explain various authentication protocols detail. 10
- b. List and explain in detail security features of operating system. 10

Q3.

- a. Explain the role of SSH. What is the difference between HTTP and HTTPS? 10
- b. List different poly-alphabetic substitution ciphers. Use Hill cipher to encrypt the text "short". The key to be used is "hill". 10

Q4.

- a. Define digital signature.  
P=7 and Q=17 are two prime numbers. If E=5 as public key,  
find the cipher text for 5. Also decrypt the cipher text back to get plain text. 10
- b. Explain MD-5 hash function. Compare with SHA 256. 10

Q5.

- a. Explain Penetration testing in detail. 10
- b. Explain Needham Schroeder Authentication protocol. 10

Q6. Attempt any Four.

- a. List and explain security requirements of a website 10
- b. Explain DES algorithms in detail. 10

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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.
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Q.1 Answer any 4

- (a) Define following terms. 05
- i. Project
  - ii. Critical path
  - iii. Earned value
  - iv. Process
  - v. Scope
- (b) Compare Agile and traditional software development models 05
- (c) Explain cohesion and coupling. 05
- (d) What is the golden rule for User interface Design 05
- (e) Explain W5HH Principle. 05

- Q.2 a) What is the importance of requirement analysis? Explain different Requirement engineering tasks. 10
- b) Identify any two Risks in online examination System. Perform risk assessment and prepare RMMM Plan for any one risk. 10

- Q.3 a) Prepare SRS for Railway Reservation System. 10
- b) Explain following testing strategies 10
- i. Unit Testing
  - ii. Integration Testing
  - iii. Validation Testing
  - iv. System Testing

Q.4 a) Draw CFG and calculate cyclomatic complexity for the given PDL

```
if(c1 or c2 )
do
    s1;
    s2;
while (c3)
else
    while(c4)    s3;
s4;
```

10

- b) Explain Software Design concepts. 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 any 4.

20

- i. FTR
- ii. PMBOK Knowledge Areas
- iii. Scrum Model
- iv. SCM Process
- v. Software Reengineering

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Time: 3 Hours

Max Marks: 80

Instructions:

- Figures to the right indicate max marks.
- Draw appropriate diagram whenever applicable.
- Assume suitable data wherever applicable. State your assumptions clearly.
- **Question number 1 is compulsory.**
- Attempt **any Three** questions from remaining questions.

**Q1 Attempt Any Four from the following. (5 marks each) 20**

- Differentiate different Machine Learning approaches. What is Cross Validation? Discuss bias variance trade-off with suitable diagram.
- Explain SVD and its applications.
- Discuss Support Vector Machines.
- Explain Eigen values and vectors.
- Implement XOR function using McCulloch Pitts Model

**Q2 a) In the classification model, the values for the observations are as follows. True Negatives(TN) =300, True Positive(TP)=500, False Positive (FP) = 50, False Negatives (FN)=150. Evaluate the performance of the model by finding values of Accuracy, Precision, Recall and F1-Score. 10**

b) What is the trace of a Matrix. What are its properties? 10

**Q3 a) Diagonalize the Matrix 10**

$$A = \begin{bmatrix} 1 & 3 \\ 2 & 2 \end{bmatrix}$$

- b) Find Singular Value Decomposition of given matrix and indicate insights about linear transformations conveyed by this method. 10

$$A = \begin{bmatrix} 3 & -5 \\ 4 & 0 \end{bmatrix}$$

**Q4 a) Discuss different activation functions used in Neural Networks. (Formula, Graph and Range). 10**

- b) Implement the **ANDNOT** logic functions using McCulloch Pitts Model. 10

**Q5 a) Implement OR function (logic gate) using single layer perceptron. Assume initial values of weights and learning rate as follows  $w_1=0.6$ ,  $w_2=1.1$  learning rate = 0.5, Threshold =1 10**

- b) Explain Multilayer perceptron with a neat diagram and its working with flowchart or algorithm. 10

- Q6** a) Why Dimensionality Reduction is very Important step in Machine Learning? Apply PCA on the following data and find the principle component. **10**

<b>X</b>	2	1	0	-1
<b>Y</b>	4	3	1	0.5

- b) Explain Back Propagation Neural Network with flowchart. **10**

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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 Justify or Contradict: Every image has a unique histogram
- B Justify or Contradict: The zeroth (LSB) plane of the bit plane slicing contains high frequency information of the image.
- C Justify or Contradict: Two fundamental characteristics of gray level values serve as the basis of segmentation algorithms for gray scale images.
- D Justify or Contradict: Although run length coding is lossless, it may not always result in data compression.
- E What is meant by Unitary Transform

**2 A Define i)4-adjacency ii) 8-adjacency iii)m-adjacency iv)City Block Distance (D4) v) Chess Board Distance (D8) vi)Euclidean Distance (De). Find D4, D8, Dm, De distance between p & q. For Dm distance connectivity, set  $V=\{2,3,4\}$**

[10]

<b>2(p)</b>	<b>4</b>	<b>5</b>	<b>3</b>	<b>4</b>
<b>5</b>	<b>3</b>	<b>2</b>	<b>4</b>	<b>5</b>
<b>7</b>	<b>6</b>	<b>2</b>	<b>1</b>	<b>5</b>
<b>6</b>	<b>5</b>	<b>3</b>	<b>4</b>	<b>0</b>
<b>4</b>	<b>5</b>	<b>7</b>	<b>2(q)</b>	<b>6</b>

- B Explain any five video file formats.

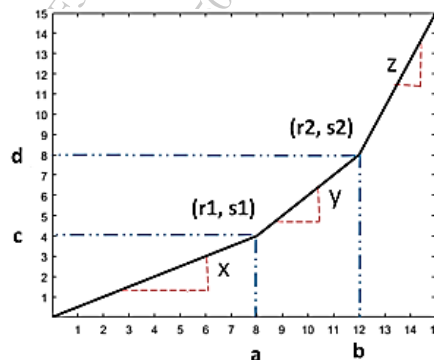
[10]

**3 A Derive Contrast Stretching Transformation function for given 4BPP image from the adjoining diagram. Modify given image pixel values.**

[10]

<b>7</b>	<b>12</b>	<b>2</b>	<b>3</b>	<b>4</b>
<b>10</b>	<b>15</b>	<b>1</b>	<b>6</b>	<b>7</b>
<b>12</b>	<b>4</b>	<b>6</b>	<b>15</b>	<b>12</b>
<b>8</b>	<b>2</b>	<b>7</b>	<b>15</b>	<b>2</b>
<b>11</b>	<b>13</b>	<b>3</b>	<b>3</b>	<b>5</b>

**S** ↑



**r** →



- B What is Image Transform? What is the significance of Image Transform? Write [10]  
basis images of Walsh Hadamard Transform.
- 4 A Explain IGS (Improved Gray Scale Quantization) compression with an [10]  
example
- B Write derivation for Prewitt Edge detection operator. What is the advantage of a [10]  
Prewitt operator? Compare Sobel & Prewitt edge operator.
- 5 A Explain **Split & Merge Method** to find region similarity. [10]  
For the following given image, find a homogeneous region using the following  
Criteria  $\max[f(x,y)] - \min[f(x,y)] \leq 3$

1	0	0	3	0	1	1	1
0	3	3	0	4	4	2	3
1	0	0	0	3	4	1	0
0	1	0	0	0	0	2	3
3	2	3	0	0	0	1	2
3	0	3	0	2	4	0	1
3	0	3	3	3	0	0	0
0	2	3	0	2	3	1	0

- B Perform Huffman Encoding on given data. Calculate average word-length, and [10]  
compression ratio.

Character	a	b	c	d	e	f
Frequency	5	9	12	13	16	45

- 6 A For a given 1D and 2D signal, apply the Walsh Transform to convert the signal [10]  
from spatial domain to frequency domain.

1D signal  $x = \{5, 8, 4, 2\}$

2 D Signal

$y =$

0	1	2	1
1	2	3	2
2	3	4	3
1	2	3	2

- B List and explain any four Zero Memory Operations with a diagram [10]  
representation and equation. Also explain why are they called as Zero Memory  
Operations

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  - 2. Attempt any three questions from remaining five questions**
  - 3. Assume suitable data if necessary and justify the assumptions**
  - 4. Figures to the right indicate full marks**

- Q1 Answer the following questions.
- A Identify and explain five issues in distributed systems. 05
  - B Analyze how Ricart-Agrawala's algorithm optimizes the message overhead in achieving mutual exclusion. 05
  - C Describe the desirable features of a global scheduling algorithm. 05
  - D Compare processes and threads. 05
- Q2
- A Explain the message communication model in distributed systems, covering transient synchronous, transient asynchronous, persistent synchronous, and persistent asynchronous communications. 10
  - B Describe the working of Remote Procedure Call (RPC) in detail, with the help of a diagram. 10
- Q3
- A Explain the Suzuki-Kasami Broadcast Algorithm for mutual exclusion. 10
  - B Analyze the architecture and performance of the Andrew File System (AFS) compared to the Network File System (NFS). Discuss the advantages and limitations of each. 10
- Q4
- A Compare load sharing, task assignment, and load balancing strategies for scheduling processes in a distributed system. 10
  - B Explain the Bully Election algorithm with the help of an example. 10
- Q5
- A Discuss different data-centric consistency models in detail. 10
  - B Explain Maekawa's algorithm for mutual exclusion and specify the properties of the Quorum Set. 10
- Q6
- A Describe code migration in distributed systems. 10
  - B Explain the features of Distributed File Systems (DFS) and draw and explain the model file service architecture. 10
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