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.

Q1 Attempt any **four** from following. [20]

A How to choose the right ML algorithm?

B Explain Regression line, Scatter plot, Error in prediction and Best fitting line.

C Explain the concept of feature selection and extraction.

D Explain K-means algorithm.

E Explain the concept of Logistic Regression

Q2 A Explain any five applications of Machine Learning. [10]

B Explain Multivariate Linear regression method. [10]

Q3 A Create a decision tree using Gini Index to classify following dataset for profit. [10]

Age	Competition	Type	Profit
old	Yes	software	down
old	No	software	Down
old	No	hardware	Down
mid	Yes	software	Down
mid	Yes	hardware	Down
mid	No	hardware	Up
mid	No	software	Up
new	Yes	software	Up
new	No	hardware	Up
new	no	software	Up

B Find SVD for $A = \begin{bmatrix} 2 & 2 \\ -1 & 1 \end{bmatrix}$ [10]

Q4 A Explain the Random Forest algorithm in detail. [10]

B Explain the concept of bagging and boosting. [10]

Q5 A Describe Multiclass classification. [10]

B Explain the concept of Expectation Maximization Algorithm. [10]

Q6 Write detailed note on following. (**Any two**) [20]

A Linear Regression

B Linear Discriminant Analysis for Dimension Reduction

C DBSCAN

Time: 3 Hours **Marks: 80**

Note: 1. Question 1 is compulsory
2. Answer any three out of the remaining five questions.
3. Assume any suitable data wherever required and justify the same.

Q1 a) Distinguish between Name node and Data node. **[5]**

b) List and explain the core business drivers behind the NoSQL movement. **[5]**

c) Mention four characteristics of big data. Elaborate these characteristics with respect to social media websites. **[5]**

d) List and explain the different issues and challenges in data stream query processing. **[5]**

Q2 a) What is a key-value store? What are the benefits of using a key-value store? **[10]**

b) Write a map reduce pseudo code to multiply two matrices. Apply map reduce working to perform following matrix multiplication. **[10]**

$$\begin{matrix}1 & 2\\ 3 & 4\end{matrix} \quad X \quad \begin{matrix}6 & 7\\ 8 & 9\end{matrix}$$

Q3 a) Suppose the stream is S = {2, 1, 6, 1, 5, 9, 2, 3, 5}. Let hash functions h(x) = ax + b mod 16 for some a and b, treat result as a 4-bit binary integer. Show how the Flajolet- Martin algorithm will estimate the number of distinct elements, h(x) = 4x + 1 mod 16. **[10]**

b) Consider the following data frame given below: **[10]**

course	id	class	marks
1	11	1	56
2	12	2	75
3	13	1	48
4	14	2	69
5	15	1	84
6	16	2	53

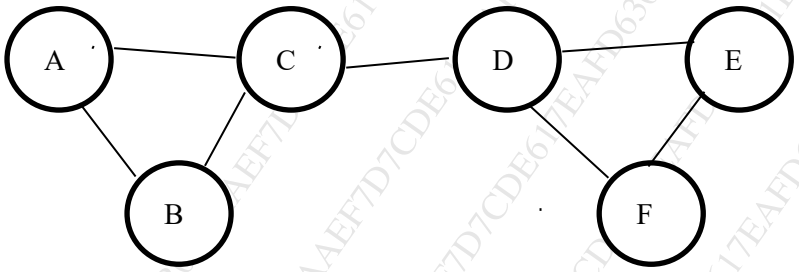
i. Create a subset of course less than 3 by using [ ] brackets and demonstrate the output.

ii. Create a subset where the course column is less than 3 or the class equals to 2 by using subset () function and demonstrate the output.

Q4 a) Explain natural join and grouping and aggregation relational algebraic operation using MapReduce. **[10]**

b) With a neat sketch, explain the architecture of the data-stream management system. **[10]**

Q5 a) Determine communities for the given social network graph using Girvan-Newman algorithm. **[10]**



b) List and discuss various types of data structures in R. **[10]**

Q6 a) i. The following table shows the number of units of different products sold on different days: **[10]**

Product	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
Bread	12	3	5	11	9
Milk	21	27	18	20	15
Cola Cans	10	1	33	6	12
Chocolate bars	6	7	4	13	12
Detergent	5	8	12	20	23

Create five sample numeric vectors from this data.

ii. Name and explain the operators used to form data subsets in R.

b) Define collaborative filtering. Using an example of an e-commerce site like flipkart or amazon describe how it can be used to provide recommendation to users. **[10]**

Duration: - 3 Hours **Marks: 80 Marks**

NB: - Question 1 is compulsory
Solve any four questions from Question no. 1 .
Solve any three questions from the remaining.

1	a.	Discuss the objectives of information retrieval systems?	**20 (4x5)**
	b.	Explain the process of Structured Text retrieval model.	
	c.	Explain the taxonomy of Information retrieval Model.	
	d.	Explain the role of pattern matching in Information retrieval.	
	e.	Explain multimedia indexing approach.	
2	a.	Illustrate information retrieval system? Discuss its relationship to DBMS, digital libraries and data warehouses	**10**
	b.	Explain in detail about vector-space retrieval models with an example?	**10**
3	a.	What is local and global analysis and Differentiate between automatic local analysis and global analysis?	**10**
	b.	What is the role of suffix array and suffix tree in information retrieval system with example.	**10**
4	a.	What is the Signature File ? Explainthe structure of signature files with example?	**10**
	b.	What is the significance tf and idf ? How can you calculate tf and idf in vector model?	**10**
5	a.	Compare and contrast evaluation of ranked and unranked Retrieval Results ?	**10**
	b.	Explain Query Processing in context of Distributed IR?	
6		Write short notes on **any two**	**20**
	a.	Roccio method for Query expansion	
	b.	Parametric and zone indices	
	c.	Latent Semantic Indexing Model	
	d.	Flat browsing vshypertext browsing model.	

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

N.B. (1) Question No. 1 is compulsory

(2) Assume suitable data if necessary

(3) Attempt any three questions from the remaining questions

Q.1 Solve any Four out of Five **5 marks each**

a Explain the challenges of Natural Language processing.

b Explain how N-gram model is used in spelling correction

c Explain three types of referents that complicate the reference resolution problem.

d Explain Machine Translation Approaches used in NLP.

e Explain the various stages of Natural Language processing.

Q.2 10 marks each

a What is Word Sense Disambiguation (WSD)? Explain the dictionary based approach to Word Sense Disambiguation.

b Represent output of morphological analysis for Regular verb, Irregular verb, singular noun, plural noun Also Explain Role of FST in Morphological Parsing with an example

Q.3 10 marks each

a Explain the ambiguities associated at each level with example for Natural Language processing.

b Explain Discourse reference resolution in detail.

Q.4 10 marks each

a

<S>	Martin	Justin	can	watch	Will	<E>
<S>	Spot	will	watch	Martin	<E>	
<S>	Will	Justin	spot	Martin	<E>	
<S>	Martin	will	pat	Spot	<E>	

For given above corpus,

N: Noun [Martin, Justin, Will, Spot, Pat]

M: Modal verb [can , will]

V:Verb [watch, spot, pat]

Create Transition Matrix & Emission Probability Matrix

Statement is "Justin will spot Will"

Apply Hidden Markov Model and do POS tagging for given statements

b Describe in detail Centering Algorithm for reference resolution.

Q.5 10 marks each

a For a given grammar using CYK or CKY algorithm parse the statement **"The man read this book"**

Rules:

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

b Explain Porter Stemmer algorithm with rules

Q.6 10 marks each

a Explain information retrieval versus Information extraction systems

b Explain Maximum Entropy Model for POS Tagging