

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)**

**CLASS: MTECH/PRE-PHD
BRANCH: AIML**

**SEMESTER : I
SESSION : MO/2025**

SUBJECT: AI503 ADVANCED CONCEPTS OF UNSUPERVISED LEARNING

TIME: 3 Hours

FULL MARKS: 50

INSTRUCTIONS:

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
 2. Attempt all questions.
 3. The missing data, if any, may be assumed suitably.
 4. Before attempting the question paper, be sure that you have got the correct question paper.
 5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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		CO	BL
Q.1(a)	Cluster analysis can be used to discover patterns within a dataset. Justify the statement with examples from different application domains.	[5] 1	5
Q.1(b)	Differentiate between a Data matrix and dissimilarity matrix. Illustrate with an example.	[5] 1	3
Q.2(a)	Apply the agglomerative hierarchical clustering for the following datapoints. {A(1,1), B(2,3), C(3,5), D(4,5), E(6,6), and F(7,5)}. Use Single link and Manhattan distance measures. Write the proximity matrix at each step.	[5] 2	3
Q.2(b)	Describe the working of K-Means algorithm with the help of an example. What are the limitations of K-Means algorithm?	[5] 2	4
Q.3(a)	What is density-based clustering? For the dataset {A(1,1), B(2,2), C(1,3), D(3,1), E(1,5), F(4,5), G(6,5), H(6,3), I(5,3)} start with A and apply the DBSCAN algorithm to identify the first cluster. Epsilon $\epsilon = 2$, Minpts=3.	[5] 3	3
Q.3(b)	Write a short note explaining the STING clustering technique.	[5] 3	2
Q.4(a)	Describe the computation of Silhouette coefficient with an example.	[5] 4	5
Q.4(b)	Briefly explain (i) Purity and (ii) F-measure.	[5] 4	3
Q.5(a)	What is an outlier? Discuss the challenges of outlier detection.	[5] 5	5
Q.5(b)	Briefly describe the outlier detection methods with examples.	[5] 5	3

:25/11/2025:E