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

CLASS: BTECH **SEMESTER : VI**
BRANCH: AIML **SESSION : SP/2025**

SUBJECT: AI303 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.

			CO	BL
Q.1(a)	Discuss how cluster analysis can be used to discover patterns and structures within a dataset. Provide examples where this might be useful.	[5]	1	5
Q.1(b)	In a dendrogram, what does it mean when two clusters are merged at a very high height? Explain how dendrograms can be useful in identifying outliers or noise in the data.	[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 probabilistic algorithm for hierarchical clustering.	[5]	2	6
Q.3(a)	Describe the working of K-Means algorithm with the help of an example. What are the limitations of K-Means algorithm?	[5]	3	5
Q.3(b)	Consider the following dataset with 5 points: {A(2,3), B(2,6), C(1,4), D(7,8), E(5,6)}. Use K-Medoid with K=2 to find the clusters. Choose A and B as initial medoids (representative objects). Compute the error. Consider E as the replacement for the second medoid. Should this replacement be done?	[5]	3	3
Q.4(a)	Describe the ROCK algorithm.	[5]	4	5
Q.4(b)	What is density-based clustering? For the dataset {A(1,1), B(1,2), C(1,4), D(2,2), E(5,2),F(5,3), G(4,3), H(4,0)} identify core, noise and border objects for Epsilon ε =2, Minpts=3.	[5]	4	3
Q.5(a)	Describe the computation of Silhouette coefficient with an example.	[5]	5	5
Q.5(b)	Briefly explain (i) Purity and (ii) F-measure. Illustrate using the following contingency table. Show all the intermediate computations.	[5]	5	4

	T1	T2	T3
C1	0	7	3
C2	12	0	0
C3	0	1	7

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