

**School of Information Technology  
IIT Kharagpur**

**Course Id: IT60113 Advanced Database Systems**

**End Sem Exam**

**Date: November 22, 2007**

**Total Time: 3 Hours**

**Max. Marks: 100**

**Answer Q. No. 1 and any 3 from the rest. You may answer the questions in any order. However, all parts of the same question must be answered together. Clearly state any assumption that you make.**

1. Consider the following set of 2-D points: (0,0), (10,10), (20,20), (5,5), (40,40), (25,25).

- (a) Construct an R-Tree with  $M=2$  and  $m=1$  for the above set of data points, assuming that the data arrived in the above sequence. Show each intermediate step. You do not need to write the algorithms, but must clearly (in one sentence each) explain the steps as you proceed.
- (b) Once the R-Tree has been constructed, the entry (20,20) is to be deleted. Show the new R-Tree, explaining the individual steps (one sentence each).
- (c) Consider a query point (16,16). Find its nearest neighbor using the R-Tree constructed in (a) above following MINDIST ordering in the Active Branch List. Apply suitable downward and upward pruning using MINDIST and MINMAXDIST based heuristics. Explain each step in brief as you proceed. **[12+4+12=28]**

2.

- (a) Consider the following two relations  $r$  and  $s$  available in two sites  $S_1$  and  $S_2$ , respectively. We need to compute the natural join of  $r$  and  $s$ , with the results made available in site  $S_1$ . Explain how semi-join processing can be applied, clearly showing the intermediate and the final results.

A	B	C
1	2	3
4	5	6
1	2	4
5	3	2
8	9	1

$r$

C	D	E
3	4	5
3	6	8
2	3	2
1	4	1
1	2	3

$s$

- (b) What are the failures that can occur during two-phase commit for a distributed transaction?
- (c) For each failure, explain how two-phase commit can ensure atomicity.
- (d) Which of these failures is handled in a better way by three-phase commit and how?

**[8+6+6+4=24]**

