

COURSE CODE: 10B11CI312

MAX. MARKS: 50

COURSE NAME: Database Systems

COURSE CREDITS: 4

MAX. TIME: 2 HRS

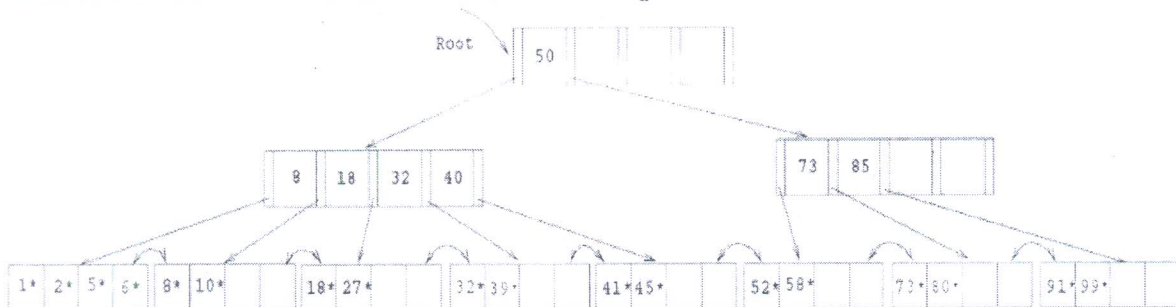
Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.

- Q1) Draw a state diagram and discuss the typical states that a transaction goes through during execution. [7]
- Q2) How the schedules are characterized based on serializability? [7]
- Q3) When the system recovers from a crash, it constructs an undo-list and a redo-list. Explain why log records for transactions on the undo-list must be processed in reverse order while those log records for transactions on the redo-list are processed in a forward direction. [7]
- Q4) Consider a relational database table which is stored in a database file using fixed length records and a free list. The file appears initially as follows:

header				free list
record 0	Alexei Yashin	Senators	19	
record 1				
record 2	Matts Sundin	Maple Leafs	13	
record 3	Mark Messier	Canucks	11	
record 4				
record 5	Jeff Hackett	Canadiens	31	
record 6				
record 7	Paul Kariya	Mighty Ducks	9	
record 8	Garth Snow	Canucks	30	

Show the structure of the file after the following actions:

- Insert (Sergei Fedorov, Red Wings, 91)
 - Delete the record containing 'Matts Sundin'. Assume that this is done before part a) is completed.
 - Insert (Patrick Roy, Montreal, 30). This should be done after the structure after part a) is completed.
- Q5) Consider the B+ tree index of order $d = 2$ shown in the figure below.



- Show the tree that would result from inserting a data entry with key 9 into this tree.
 - Show the B+ tree that would result from inserting a data entry with key 3 into the original tree. How many page reads and page writes does the insertion require?
 - Show the B+ tree that would result from deleting the data entry with key 8 from the original tree, assuming the left sibling is checked for possible redistribution.
 - Show the B+ tree that would result from deleting the data entry with key 8 from the original tree, assuming the right sibling is checked for possible redistribution. [8]
- Q6) Modern disk drives store more sectors on the outer tracks than the inner tracks. Since the rotation speed is constant, the sequential data transfer rate is also higher on the outer tracks. The seek time and rotational delay are unchanged. Given this information, explain good strategies for placing files with the following kinds of access patterns:
- Frequent, random accesses to a small file (e.g., catalog relations).
 - Sequential scans of a large file (e.g., selection from a relation with no index).
 - Random accesses to a large file via an index (e.g., selection from a relation via the index).
 - Sequential scans of a small file. [7]

- Q7. Show that there are schedules that are possible under 2PL but are not possible under the timestamp protocol, and vice versa. [7]