Indian Institute of Information Technology UNA Himachal Pradesh
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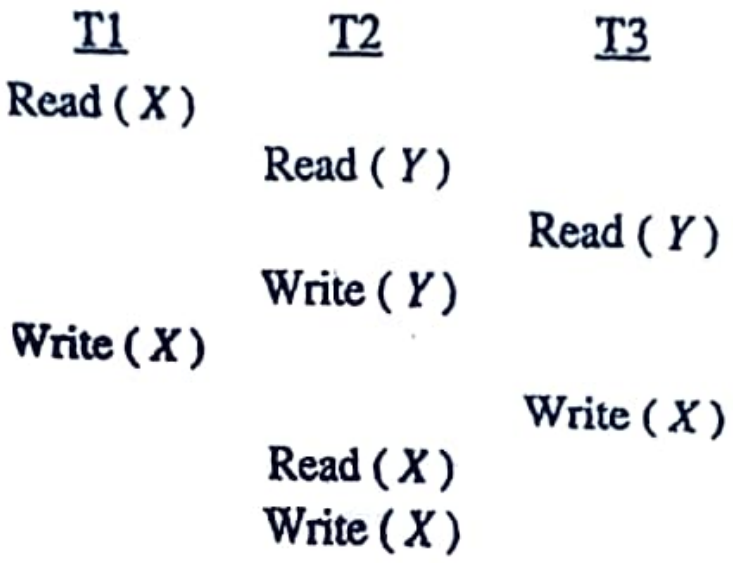
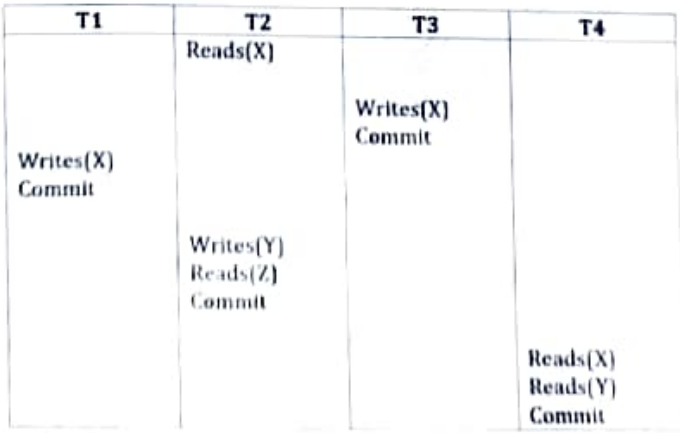
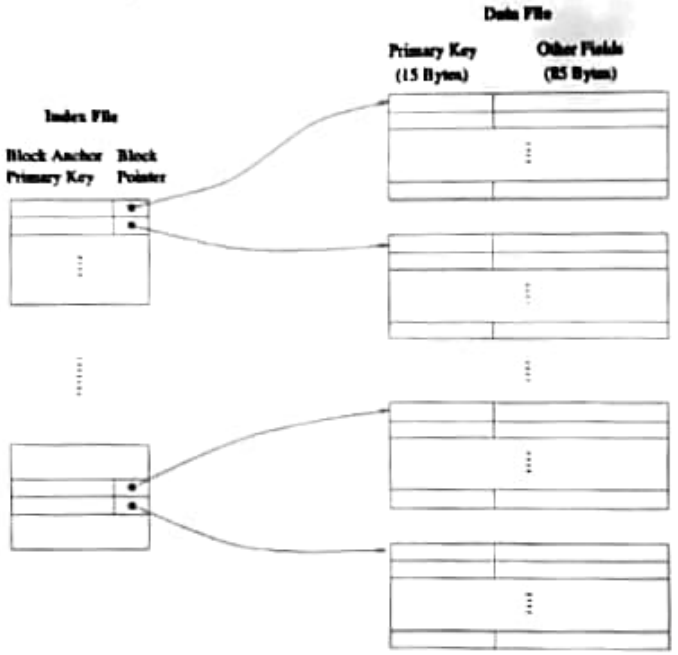
AY 2024-25
School of computing
CURRICULUM: IIITUGCSE22
Cycle Test – II
01, April.'24

Degree	B. Tech.	**Branch**	CSE
Semester	IV		
Subject Code & Name	CSC401 / Database Management Systems		
Time: 60 Minutes	**Answer All Questions**		**Maximum: 20 Marks**

Sl. No.	Question	Marks
1. a	For the relation R(ABCDEFGH) with FD's= {CH->G, A->BC, B->CHF, E->A, F->EG such that F+ is exactly the set of FDs that hold for R.} Consider the given FDs, find the highest Normal form for relation R.	1
1. b	Consider the relation REFRIG (Model#, Year, Price, Manuf_plant, Color), which is abbreviated as REFRIG (M, Y, P, MP, C), and the following set F of functional dependencies: F = {M→MP, {M, Y} →P, MP→C}. i. Evaluate each of the following as a candidate key for REFRIG. ii. Based on the above key determination, state whether the relation REFRIG is in 3NF and in BCNF, with proper justification. iii. Consider the decomposition of REFRIG into D = {R1(M, Y, P), R2(M, MP, C)}. Is this decomposition lossless?	2
1. c	What is a transaction? Explain the ACID properties of a transaction with a suitable example.	2
2. a	Consider a schema R (A, B, C, D) and functional dependencies A->B and C->D. The relation R is decomposed into R1(AB) and R2(CD). Check whether the relation is dependency preserving.	1
2. b	Check whether the given schedule is Conflict serializable or not using a precedence graph, and also check for the view serializability. S1:R1(X) R2(Z) R1(Z) R3(X) R3(Y) W1(X) W3(Y) R2(Y) W2(Z) W2(Y)	2
2. c	Explain the different states of a transaction with a neat diagram.	2
3. a	Consider the following schedule for transactions T1, T2 and T3:	1

	 Find out the correct order of schedule.	
3. b	i. Explain the following terms: 1. Dirty Read 2. Lost update problem ii. Consider the following relational schemes for a library database: Book (Title, Author, Catalog_no, Publisher, Year, Price) Collection (Title, Author, Catalog_no) The following are functional dependencies: Title Author → Catalog_no Catalog_no → Title Author Publisher Year Assume {Author, Title} is the key for both schemes. Apply the appropriate normal form for the Book and Collection.	2
3. c	What is indexing, what are the different kinds of indexing? Explain each indexing with a suitable example.	2
4. a	Consider the following schedule S of transactions T1, T2, T3, T4:  Check whether the schedule is conflict serializable or not. Also, check whether the schedule is recoverable or irrecoverable.	1

4. b	Consider a database of fixed-length records stored as an ordered file. The database has 25,000 records, with each record being 100 bytes, of which the primary key occupies 15 bytes. The data file is block-aligned in that each data record is fully contained within a block. The database is indexed by a primary index file, which is also stored as a block-aligned ordered file. The figure below depicts this indexing scheme.  Suppose the block size of the file system is 1024 bytes, and a pointer to a block occupies 5 bytes. The system uses binary search on the index file to search for a record with a given key. You may assume that a binary search on an index file of b blocks takes $[\log_2]$ block accesses in the worst case. Given a key, the number of block accesses required to identify the block in the data file that may contain a record with the key, in the worst case, is ----------.	2
4. c	Consider the three transactions T1, T2, and T3, and the schedules S1 and S2 given below. Draw the serializability (precedence) graphs for S1 and S2, and state whether each schedule is serializable or not. If a schedule is serializable. T1: r1 (X); r1 (Z); w1 (X); T2: r2 (Z); r2 (Y); w2 (Z); w2 (Y); T3: r3 (X); r3 (Y); w3 (Y) S1: r1 (X); r2 (Z); r1 (Z); r3 (X); r3 (Y); w1 (X); w3 (Y); r2 (Y); w2 (Z); w2 (Y); S2: r1 (X); r2 (Z); r3 (X); r1 (Z); r2 (Y); r3 (Y); w1 (X); w2 (Z); w3 (Y); w2 (Y);	2