



**National Institute of Technology, Tiruchirappalli - 15.**  
**Department of Computer Science & Engineering**  
**CSPC52- Database Management Systems**  
**End Semester Examination-December 2021**

**Class / Semester : III yr CSE / V sem.**

**Time : 12:00 to 2.00 PM**

**Date : 03/12/2021**

**Max. Marks : 30**

**Answer all questions**

1. Consider the following transaction schedules. For each schedule, indicate if it is conflict-serializable and view serializable or not. Justify your answer using precedence graph. If it is conflict serializable, then find its conflict equivalent serial schedules.

(4)

T1	T2	T3
R(A)		
	R(B)	
		R(C)
W(C)		
	W(A)	
		W(B)

T1	T2	T3
R(A)		
R(B)		
W(A)		
	R(B)	
	W(A)	
		R(C)
		R(B)
		R(D)
	W(B)	
W(C)		
		W(D)

2. A General Hospital consists of a number of specialized wards (Such as Maternity, Paediatrics, Oncology, etc). Each ward hosts a number of patients, who were admitted on the recommendation of their own GP and confirmed by a consultant employed by hospital. On admission, the personal details of every patient are recorded. A separate register is to be held to store the information of the tests undertaken and the results of a prescribed treatment. A number of tests may be conducted for each patient. Each patient is assigned to one leading consultant but may be examined by another doctor, if required. Doctors are specialists in some branch of medicine and may be leading consultant for a number of patients, not necessarily from the same ward. (4)
- (i). Construct an EER diagram for the Hospital database.
- (ii). Convert into relational model.
- (iii). Take four typical queries and write them in SQL.
3. Consider the relation schema  $R(A_1, A_2, A_3, A_4, A_5, A_6, A_7, A_8)$  with the set of functional dependencies  $\{A_1A_2 \rightarrow A_3, A_1A_3 \rightarrow A_2, A_1A_4 \rightarrow A_5, A_2 \rightarrow A_4, A_2A_3 \rightarrow A_1, A_5 \rightarrow A_7\}$ . List the candidate keys for the relation R and decompose the relation into BCNF. (3)
4. Find the minimal cover for the following set of Functional dependencies:  $F \{A_1 \rightarrow A_2, A_2 \rightarrow A_3, A_1 \rightarrow A_3, A_1A_2 \rightarrow A_1\}$  (2)
5. Find  $F^+$  for the following set of functional Dependencies: (3)  
 $F: \{A \rightarrow B, BC \rightarrow D\}$

6. Construct B+ tree to insert the following numbers (order of the tree is 3). Draw the B+ tree for each insertion. (3)

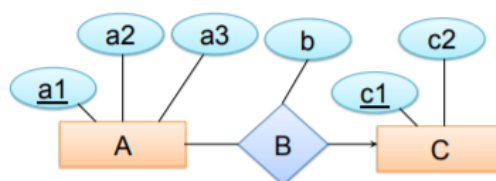
1, 4, 7, 10, 17, 21, 31, 25, 19, 20, 28, 42, 12, 34, 23

7. Consider the following search key values and the 6-bit hash values on the search key. With neat diagram explain all the steps needed for inserting each and every record from the file to the extendable hash structure with an assumption that a bucket can hold only four records. (3)

key	$h(\text{key}) = \text{key} \bmod 64$	bit pattern
288	32	100000
8	8	001000
1064	40	101000
120	56	111000
148	20	010100
204	12	001100
641	1	000001
700	60	111100
258	2	000010
1586	50	110010
44	44	101010

Then insert the search keys values 68, 48, 575, 16, 18, 22, 23 one by one and obtain the new structure.

8. Write the correct Create Table statement to have minimum and maximum number of tables for the given ER-Diagram. (2)



9. Find the result of these expressions: (4)

R				S		
A	B	C	D	D	C	E
1	2	3	4	1	2	3
2	2	5	1	3	4	7
3	4	2	6	4	5	5
4	2	5	3	5	2	7

- $R \bowtie S$
- $R \bowtie_{R.C=S.C} S$
- $\Pi_{B,E}((\Pi_{B,C}R) \bowtie (\sigma_{E<7}S))$
- $(\Pi_{A,B}R) \rho_{S(A,B)}(\Pi_{D,C}S)$

10. Consider a simple checkpointing protocol that operates on the serial execution of transactions. The following set of operations are in the log: (2)

(start, T8); (write, T8, y, 2, 3); (start, T5); (commit, T8);  
 (write, T5, z, 5, 7); (commit, T5)  
 (start, T6); (checkpoint); (write, T6, x, 1, 9); (start, T7);  
 (write, T7, z, 7, 2); (commit, T7)

If a crash happens now and the system tries to recover using immediate and deferred recovery schemes, List the actions to be done by each transactions T5 to T8.