CLASS TEST

S.No. : 01 SK_CS_A_210323

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DBMS

COMPUTER SCIENCE & IT

Date of Test : 21/03/2023

ANSWER KEY

1.	(b)	7.	(b)	13.	(a)	19.	(c)	25.	(d)
2.	(a)	8.	(c)	14.	(a)	20.	(a)	26.	(c)
3.	(d)	9.	(c)	15.	(c)	21.	(a)	27.	(d)
4.	(b)	10.	(c)	16.	(c)	22.	(d)	28.	(b)
5.	(b)	11.	(c)	17.	(c)	23.	(c)	29.	(c)
6.	(b)	12.	(d)	18.	(b)	24.	(b)	30.	(d)

DETAILED EXPLANATIONS

1. (b)

$$A^+ = \{A\ B\ C\ D\ E\ F\}$$
$$B^+ = \{A\ B\ C\ D\ E\ F\}$$
$$D^+ = \{A\ B\ C\ D\ E\ F\}$$

Clearly, there are three candidate keys.

Thus, $N(A \cup B \cup D) = N(A) + N(B) + N(D) - \{N(A \cap B) + N(B \cap D) + N(A \cap D) + N(A \cap B \cap D)\}$

Where, $N(A \cap B \cap D)$ represents number of super keys where A or B or D is candidate keys.

$$\Rightarrow \quad N(A \cup B \cup D) = 3 \times 2^5 - 3 \times 2^4 + 2^3$$
$$= 96 - 48 + 8 = 56$$

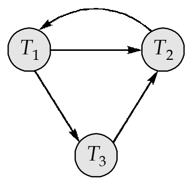
2. (a)

- Option (a) is incorrect.
- All other options (b), (c) and (d) are correct.

3. (d)

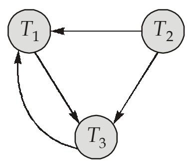
Let's draw precedence graph:

I. Precedence Graph



There is cycle present. Hence, it cannot be conflict serializable.

II. Precedence Graph



It contain cycle. Hence, it cannot be conflict serializable.

4. (b)

The SQL returns the distinct flight names who does not have any travellers.

5. (b)

Check G covers H:

1. $A \to B$ cannot be derived from G which is present in H, So G not covers H.

Check H covers G:

1. $CA \to B$ can be derived from H i.e. $A \to B$ then $CA \to CB$.
2. $BA \to D$ can be derived from H i.e. $A \to B$, $B \to AC$, $AC \to D$ then $B \to D$ and AB
3. $B \to D$ can be derived from H i.e. $A \to B$, $B \to AC$, $AC \to D$ then $B \to D$.
4. $DB \to C$ can be derived from H i.e. $B \to C$ then $DB \to DC$.

Hence H covers G.

6. (b)

$$^nC_{n-2} \Rightarrow \frac{n(n-1)(n-2)!}{(n-2)! \times 2} = \frac{n(n-1)}{2} \text{ Candidate keys.}$$

If every $(n - 2)$ attributes are Candidate keys
then every $(n - 1)$ and n attributes are also Superkeys

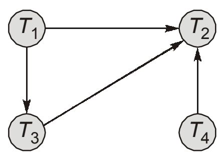
$$\text{Total Super keys} = {}^nC_{n-2} + {}^nC_{n-1} + {}^nC_n$$
$$= {}^nC_{n-2} + n + 1$$
$$= \frac{n(n-1)}{2} + n + 1$$

7. (b)

In data base until check point not come data is not saved permanently, when checkpoint is comes all database until checkpoint all data stored permanently.
After checkpoint process which are committed are redo and which are not committed are undo:
So, undo is to be transaction T_3 redo is to be transaction T_4.

8. (c)

The precedence graph of the given schedule is



Therefore schedule is equivalent to
T_1, T_4, T_3, T_2 and T_1, T_3, T_4, T_2

9. (c)

Candidate keys for the relation are: AB, BD and BC
D → A, prime attribute → prime attribute (not allowed in BCNF but allowed in 3NF).
⇒ Relation R is in 3NF but not in BCNF since D → A does not have a superkey on the left hand side.

10. (c)

If (4, 3) is deleted then 4 is the primary key but in (2, 4), (6, 4) and (3, 4), 4 is the foreign key so these must be deleted.
The primary key for (2, 4), (3, 4) and (6, 4) is 2, 3 and 6 respectively must be deleted but in (5, 2) and (7, 2) with primary key 5 and 7 is the foreign key also deleted and (9, 5) is also deleted because 5 is primary key which is already deleted.

11. (c)

- Option (a) has partial dependency i.e. D → E hence not in 2NF.
- Option (b) also has partial dependency. Hence not in 2NF.
- Option (c), candidate keys = {AB, DB, CB} and all RHS of FD is prime attribute. Hence it is in 3NF and L.H.S. are not key so not in BCNF.
- Option (d) is BCNF.

12. **(d)**

A → 2, B → 3, C → 4, D → 1

13. **(a)**

Option (a) : For each given FD, the closure of the left-side attributes is ABCDE. Thus, the left-side attributes of each FD contain a key, and the relation is in BCNF.
Option (b) : B^+ = AB, so B → A is a BNCF violation.
Option (c) : B^+ = BC, so B → C is a BNCF violation.
Option (d) : BC^+ = BCE, so BC → E is a BNCF violation.
Hence option (a) is answer.

14. **(a)**

If S does not have dirty read then S is cascadeless rollback but may not be strict recoverable.

15. **(c)**

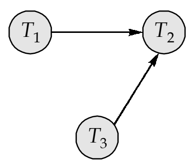
- The AND evaluates to UNKNOWN (x_1 AND x_2) when atleast one of the x_1 or x_2 is NULL and neither x_1 nor x_2 is FALSE.
- So, both the statement results in UNKNOWN.

16. **(c)**

Both query I and II results in $X \cap Y$.

17. **(c)**

Precedence graph:



- S is conflict serializable.
- S contain dirty read problem i.e. $[w_1(x) \rightarrow r_2(x)]$.
- S does not contain blind write.
- S is recoverable because transaction 1 is committing first.

So, option (c) is correct.

18. **(b)**

B+ trees are faster for range queries compared to B trees.

19. **(c)**

There is no instructor with name 'Shiva' in Course Table so query results in all distinct Sid's from Enrolment table.

20. **(a)**

Option (a) returns all the tuples where Rollno of Student matches with Rollno in Library.

21. **(a)**

S_1 and S_2 are same as 'ANY' and 'IN' conditions will give the same result.

22. (d)

$$(AB)^+ = A\ B\ C\ D\ E\ F$$
$$(AC)^+ = C\ D\ E\ A\ F\ B$$
$$(AD)^+ = D\ E\ A\ F\ B\ C$$
$$(AF)^+ = A\ F\ B\ C\ D\ E$$
$$(AE)^+ = A\ E\ F\ B\ C\ D$$

There are 5 candidate keys are present for given relation.

23. (c)

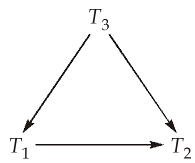
In this query, we can explicitly show the sequence of operations, giving a name to each intermediate relation. 1st intermediate will have SSN of all the managers, 2nd intermediate will have SSN of all the employees with dependents. 3rd intermediate will have those department managers who don't have any dependent. Final result will give the name of those department managers who have no dependents.

24. (b)

From the question it can be concluded that:
{Doctor #, Patient #, Date} $\rightarrow$ {Diagnosis, Treat_code, charge}
Treat_code $\rightarrow$ charge
Since there is no partial dependency, hence the relation is in 2NF, but since, 'Treat_code' a non-prime attribute. Hence the relation is not in 3NF.

25. (d)

If you construct precedence graphs for first three schedules we will get cycle, hence they are not conflict serializable. Precedence graph for schedule 4 is shown



26. (c)

Both queries retrieve the name of each employee who has a dependent with the same first name and is the same sex as the employee.
In the nested query of Q1, we must qualify E.Sex because it refers to the Sex attribute of EMPLOYEE from the outer query and DEPENDENT also has an attribute called Sex. If there were any unqualified references to Sex in the nested query, they would refer to the Sex attribute of DEPENDENT. However, we would not have to qualify the attributes Fname and Ssn of EMPLOYEE if they appeared in the nested query because the DEPENDENT relation does not have attributes called Fname and Ssn, so there is no ambiguity.

27. (d)

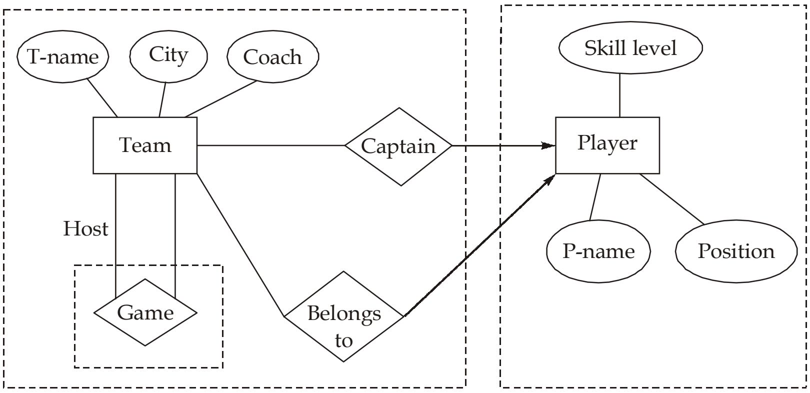
NOT (The inner query returns parts supplied by atleast 2 supplier).
So, it returns Pids by atmost 1 supplier.
So, option (d) is correct.

28. (b)

Relation returned by the SQL query:

Sname	Grade
Andy	210
John	177
Vin	153

29. (c)



Total 3 tables are required.

30. (d)

- Root node can point 5 internal nodes.
- Total maximum number of records this B^+ tree can have = $5 \times 5 \times 4 = 100$
- Total additional records can be added

$$= 100 - 19 \text{ (available)} = 81$$

■■■■