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DBMS

COMPUTER SCIENCE & IT

Date of Test : 25/11/2025

ANSWER KEY ➤

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

DETAILED EXPLANATIONS

1. (b)

(1) Entity of E_2 associated with exactly one entity of $E_1 \Rightarrow$ Total participation of E_2 and one on E_1 side.

(2) Entity of E_1 associated with at most one entity of $E_2 \Rightarrow$ Partial participation of E_1 and one on E_2 side.

2. (c)

$$r \subseteq [(\text{domain } (A) \times \text{domain } (B) \times \text{domain } (C)]$$
$$|r|_{\max} = |\text{dom } (A)| \times |\text{dom } (B)| \times |\text{dom } (C)|$$
$$= 4 \times 10 \times 17 = 680$$

3. (d)

A is part of every candidate key, so A is fixed.

Now choose attributes from 5 remaining attributes, such that number of candidate keys is maximum, two possibilities, one is select 2 attributes and other is select 3 attributes.

$${}^5C_2 = {}^5C_3 = 10$$

4. (d)

5. (b)

A domain is defined as the set of all unique values permitted for an attribute. For ex: A domain of date is set of all possible valid date, a domain of integer is all possible whole numbers.

6. (a)

Since, Emp_No → Dept_No

and Dept_No → Deptname, Mgr_No

So, Emp_No → {Deptname, Mgr_No}

7. (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

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

8. **(c)**

- If every attribute is prime then (partial key → non key) and (non key → non key) is not possible. So, relation is always in 2NF as well as in 3NF.
- If every candidate key is simple (having exactly 1 attribute), then (partial key → non key) not possible. Hence, relation is in 2NF.
- Assume a relation R (ABC) with following functional dependencies:
  R (ABC)
  $\{AB \rightarrow C, C \rightarrow A\}$
  Candidate keys are AB and BC
  $AB \rightarrow C$ is in BCNF but $C \rightarrow A$ not in BCNF.

9. **(b)**

(Upper query results those marks which are less than atmost 3 marks, i.e. 9.8, 9.7, 9.6) union (This will return empty since no marks greater than query other marks including itself i.e. 9.7 cannot greater than 9.7)

$$= (9.8, 9.7, 9.6) \cup (\phi)$$
$$= 9.8, 9.7, 9.6$$

10. **(d)**

11. **(c)**

In B^+ tree, leaf nodes are connected as linked list, not in B-tree.

12. **(d)**

F : AB and AC are candidate keys, and $B \rightarrow C$, $DC \rightarrow B$ are FDs where LHS is not a key.
G : A, BD, CD are candidate keys.
$B \rightarrow C$ cannot possible from G.
$A \rightarrow B$ cannot possible from F.

13. **(a)**

$CD \rightarrow C$ {reflexivity}
$C \rightarrow A$
$CD \rightarrow A$ {transitivity}

14. **(c)**

15. **(b)**

Here, two dirty reads:
(i) $W_1(C)$; $R_2(C)$
(ii) $W_2(B)$; $R_4(B)$
If T_1 roll-backed, then T_2 will rollback due to (i).
If T_2 roll-backed, then T_4 will rollback.

16. (a)

For B-tree of order n,

$n \times$ (Tree pointer size) + $(n-1)$ (Key size + Data pointer size) $\leq$ Block size

$$n \times (14) + (n-1)(8+10) \leq 1024$$
$$n \times (14+18) - 18 \leq 1024$$
$$n(32) \leq 1024 + 18$$
$$n_{max} = \left\lfloor \frac{1042}{32} \right\rfloor = 32$$

Max data pointer possible = Order – 1
= $n - 1 = 32 - 1 = 31$

17. (d)

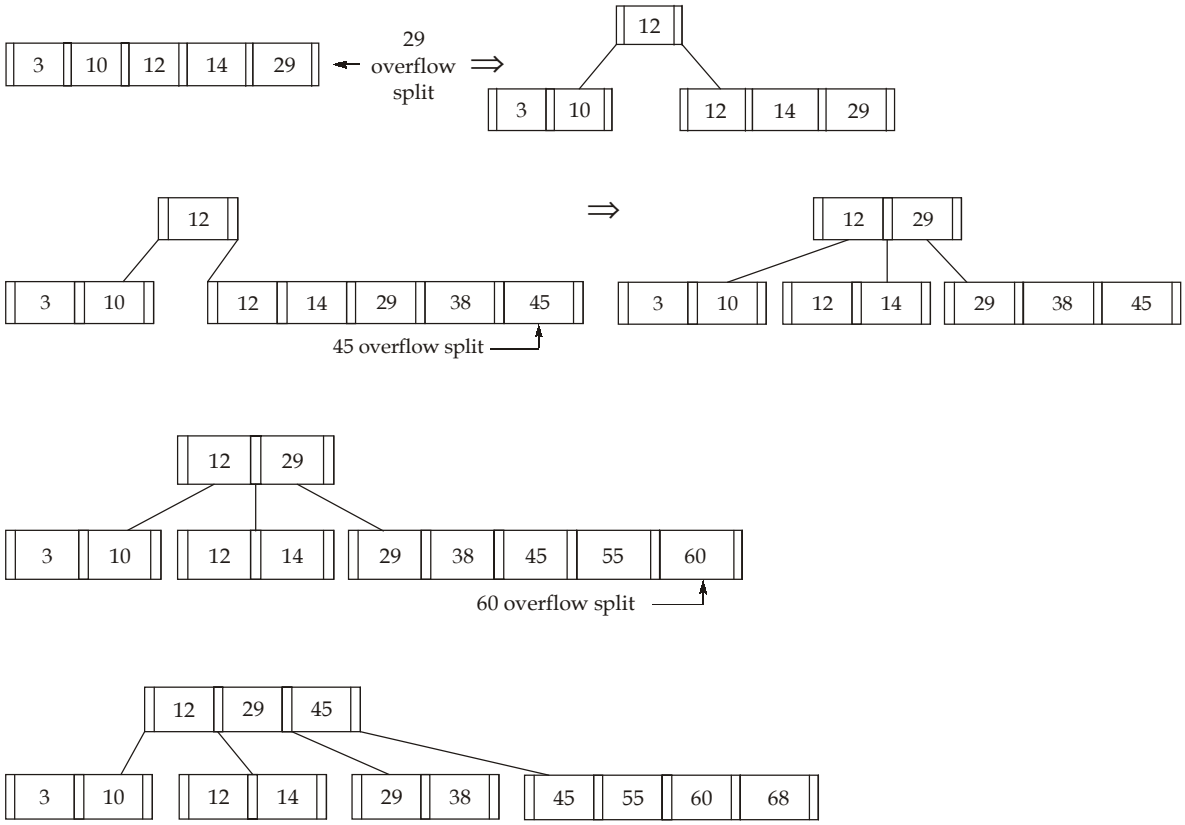
Deadlock possible in 2-PL protocol.

18. (c)

(a) If $A \subset$ (candidate key), then $A \rightarrow B$ is partial dependency, i.e. not 2NF.
(b) If $A \subset$ (candidate key), then $A \rightarrow B$ can create transitive dependency, i.e. not 3NF.
(c) This situation can possible in 3NF.
(d) If $A \subset$ (candidate key), and $B \subset$ (candidate key), then not BCNF.

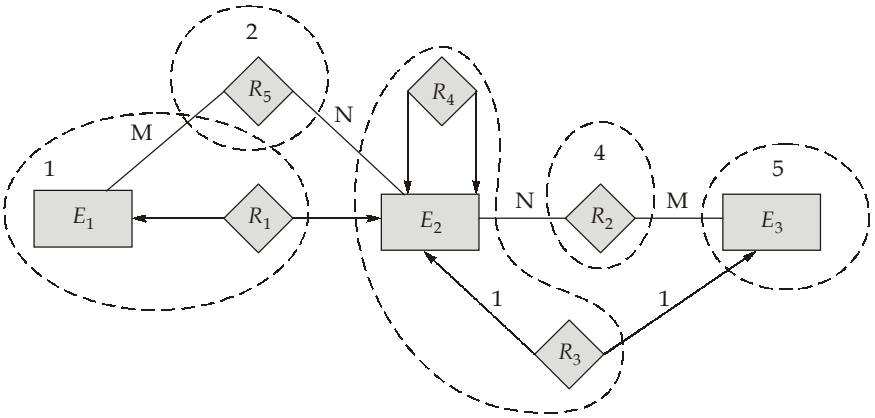
19. (a)

Number of key in internal node = 4 i.e, [5 – 1 = 4]
Number of key in leaf node = 4 i.e., [order = # Key]



So the maximum number of splits of leaf node is 3.

20. (b)

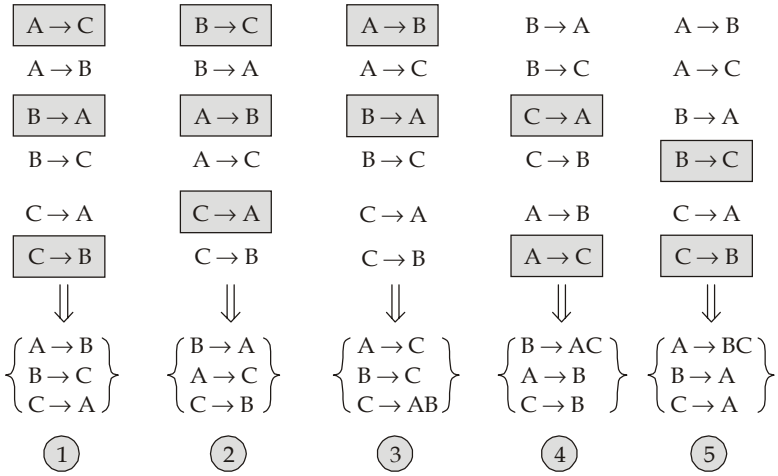


Thus total 5 tables are required.

21. (b)

- Option (b) is correct because
- In option (a) average (amount) is also fetched.
- In option (c) order by is used.
- In option (d) average amount is not there.

22. (d)



23. (d)

Finding key or R.

Since B is a essential attribute:

$$AB^+ \rightarrow ABCD$$
$$BD^+ \rightarrow ABCD$$
$$BC^+ \rightarrow BDAC$$

So the set of candidate keys are {AB, BD, BC}.

R is decomposed as:

R_1(CD)	R_2(AC)	R_3(BC)
$C \rightarrow D$	$C \rightarrow A$	$\underline{BC} \rightarrow BC$ (Trivial)

Since in all the three relations LHS is key therefore it is in BCNF.

24. **(a)**

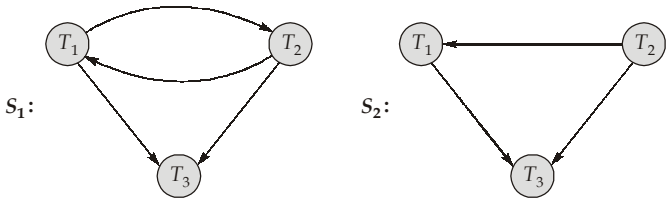
If in 2PL, all exclusive locks are acquired by transactions only in increasing order then, there is a guarantee that atleast 1 process will complete its execution and free the locked data file for the other processes to continue their execution.

25. **(c)**

For a conflict serializable schedule, the linear ordering of transactions corresponds to topological sorting of the serialization graph. Since there can be multiple such orderings, multiple equivalent serial schedules may exist.

26. **(b)**

The precedence graph for S_1 contains a cycle, hence not conflict serializable.
The precedence graph for S_2 does not contain cycle, hence conflict serializable.



27. **(b)**

A relation $R(A, B, C, D, E)$ with

$ABC \rightarrow DE$
$ADE \rightarrow BC$
$BD \rightarrow E$

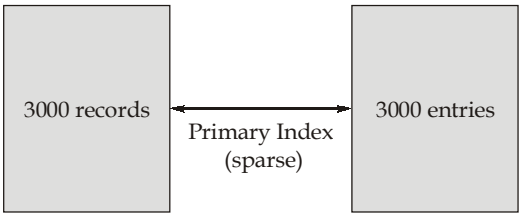
is not in BCNF and all attributes are prime. So, (b) is false.

(a) Dependency preserving sometimes not possible in BCNF decomposition.
(c) For only two attributes relation $R(A, B)$ either $A \rightarrow B$ or $B \rightarrow A$, so it is in BCNF.

28. **(c)**

In option (b), statement is division operator and it will give correct distinct result.
In option (a), here main query select a Sid and check in sub query that for selected Sid is there any course which not enrolled. Here we used, 'distinct' keyword, so it is correct query.

29. (d)



$$\text{Block factor} = \left\lceil \frac{1024}{100} \right\rceil = 10 \text{ Record/block}$$

$$\text{Number of blocks} = 3000$$

$$\text{Block factor} = \left\lfloor \frac{1024}{6+9} \right\rfloor = 68$$

$$\text{Number of blocks} = \left\lceil \frac{3000}{68} \right\rceil = 45$$

$$\text{Number of block access needed} = \lceil \log_2 45 \rceil + 1 = 7 \text{ blocks}$$

30. (b)

In general $[R_1 \bowtie R_2 \bowtie \ldots\ldots \bowtie R_n] \supseteq r$ it can never be $\subset r$, therefore option *b* is false.

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