CLASS TEST

S.No. : 01SKCS_ABCD_060524

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DBMS

COMPUTER SCIENCE & IT

Date of Test : 06/05/2024

ANSWER KEY

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

DETAILED EXPLANATIONS

1. (c)
F_1 covers F_2 : True
F_2 covers F_1 : True

2. (b)

$$\pi_{A,B}(R) \bowtie_{R.B<S.B} \rho_{S(A,B)}(\pi_{B.C}(R))$$

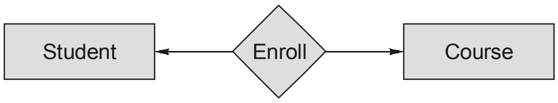
A	B
1	2
3	2

A	B
2	3
2	1

$\Rightarrow$

A	B	A	B
1	2	2	3
3	2	2	3

3. (a)



So, ER-diagram represents many student can enroll many courses.

- In ER-diagram Relationship set can have own attribute.
- Many to one relation can be represented the relation between non-weak entity set.

4. (b)
B^+ tree index has more levels than B-tree index for large number of keys. Since in B-tree every key appears at only single level but which is not the case for B^+ tree.

5. (c)

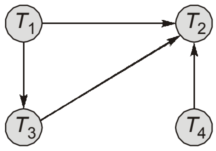
$$\frac{(3+2+1)!}{3!\cdot 2!} = \frac{6!}{3!\cdot 2!} = 60$$

6. (d)
Both the statements are incorrect.
The select operation is commutative i.e. $\sigma_{c_1}(\sigma_{c_2}(R)) \Leftrightarrow \sigma_{c_2}(\sigma_{c_1}(R))$.
Ultimately only those tupples will be selected which satisfy both C_1 and C_2. Hence order does not matter.
But Π (projection) operation is not commutative.
$\Pi_{a_1}(\Pi_{a_2}(R)) = \Pi_{a_1}(R)$ if and only if a_1 is substring (or subset) of a_2, otherwise operation would be incorrect.

7. (d)
The given locking protocol follows the properties of strict 2 PL which is conflict serializable, recoverable and avoid cascading rollbacks.

8. (c)
Candidate keys for the relation are: PQ, QS and QR
$S \rightarrow P$, prime attribute $\rightarrow$ prime attribute (not allowed in BCNF but allowed in 3NF).
$\Rightarrow$ Relation R is in 3NF but not in BCNF since $S \rightarrow P$ does have a superkey on the left hand side.

9. (c)
The precedence graph of the given schedule is



Therefore schedule is equivalent to (T_1, T_4, T_3, T_2), (T_1, T_3, T_4, T_2) and (T_4, T_3, T_1, T_2).

10. (d)

Disk block size = 5000 records

Block size = 10 records or 15 (keys + Pointers)

Sparse index at 1st level. So number of disk block at 1st level is number of block in database.

$$\text{Data base} = \frac{5000}{10} = 500 \text{ blocks}$$

$$1^{st} \text{ level} = \left\lceil \frac{500}{15} \right\rceil = \lceil 33.33 \rceil = 34 \text{ blocks}$$

$$2^{nd} \text{ level} = \left\lceil \frac{34}{15} \right\rceil = \lceil 2.26 \rceil = 3 \text{ blocks}$$

$$3^{rd} \text{ level} = 1 \text{ block}$$

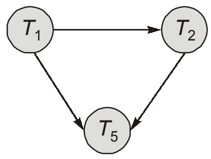
$$\text{Total} = [500 + 34 + 3 + 1] \text{ blocks}$$

$$= 538 \text{ blocks}$$

11. (b)

T_1	T_2	T_3
	$S(A)$ $R_2(A)$	
$X(B)$ $W_1(B)$ $X(C)$ $W(C)$ $S(A)$ $U(A)$		
		$S(B)$ $R_3(B)$
	$S(B)$ $R_2(B)$	
$S(B)$ $R(A)$ $U(B)$ C_1		
	$R_2(C)$ $U(A)U(B)$ C_2	
		$X(A)$ $W_3(A)$ $U(B)U(A)$ C_3

(*i*) Conflict serializable



(*ii*) Allowed by 2PL.
(*iii*) Not strict recoverable.
(*iv*) No allowed by strict 2PL.

12. (c)
If relation R in 3NF but not BCNF then atleast two compound keys must exists where non-trivial FD with determinant not superkey.

13. (c)

The given relation with functional dependencies is in 3NF i.e., no transitive and partial function dependency exist but $C \to A$, violets BCNF i.e., super key $\to$ any attributes. So, relation R in 3NF but not BCNF.

(d) $\{AB \to C, C \to A, BC \to D, BE \to C, EC \to A, CF \to B, D \to E\}$

14. (b)

$[AB \to C$		$[AB \to C$		$[AB \to C$
$C \to A$		$C \to A$		$C \to A$
$BC \to D$		$BC \to D$		$BC \to D$
$ACD \to B$	After $\Longrightarrow$ removal of extraneous attributes	$CD \to B$	After $\Longrightarrow$ removal of redundant FD's	$BE \to C$
$BE \to C$		$BE \to C$		$EC \to F$
$EC \to F$		$EC \to F$		$CF \to B$
$EC \to A$		$EC \to A$		$D \to E]$
$CF \to B$		$CF \to B$		Minimal cover
$CF \to D$		$CF \to D$		
$D \to E]$		$D \to E]$		

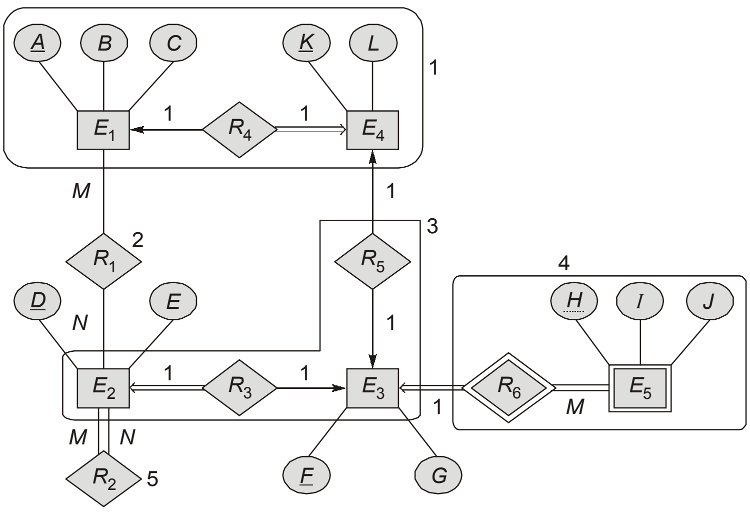
15. (a)

Condition $X = X_1$ and $Y \neq Y_1$ says that vertices whose starting vertex is same but end vertices is different, which returns vertices whose out degree is atleast 2.

16. (a)

Q_1 :Retrieves A which are more than some C.
Q_2 :Retrieves A which are more than some C.
Q_3 :Retrieves A which are more than every C.

17. (b)



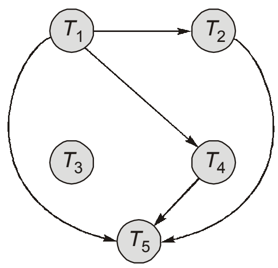
18. (a)

Order P:

$$P \times \text{Pointer} + (P-1) \times \text{Key} \leq \text{Block}$$
$$P \times 8 + (P-1)\,12 \leq 1000$$
$$20\,P \leq 1012$$
$$P = \left\lfloor \frac{1012}{20} \right\rfloor = 50$$

Level	Min nodes	Min B_P	Min keys
1	1	2	1
2	2	2 × 25	24
3	50	–	50 × 24
			1200

19. (a)



# of serial schedules conflict equal to schedule (S) is # of topological orders

$$T_1 \begin{cases} T_2 - T_4 - T_5 \\ T_4 - T_2 - T_5 \end{cases} \text{2 sequences for } T_1\, T_2\, T_4\, T_5$$

T_3 can be any where in both sequences. Total 10 topological order.

20. (b)

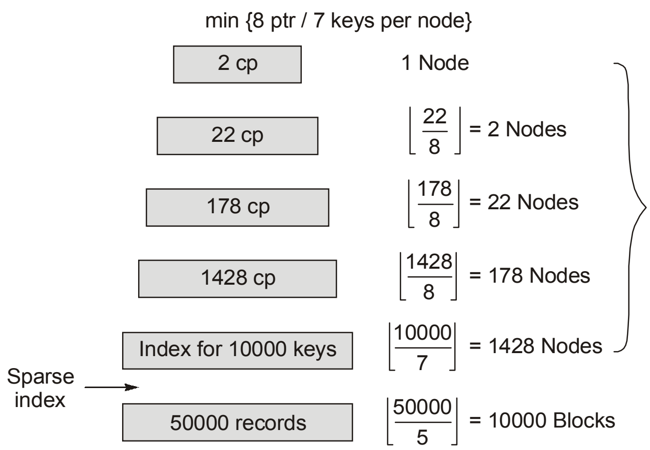
Order $P \Rightarrow P \times B_P + (P - 1)\text{ Key} \leq \text{Block}$

$$P \times 12 + (P - 1)\, 20 \leq 512$$

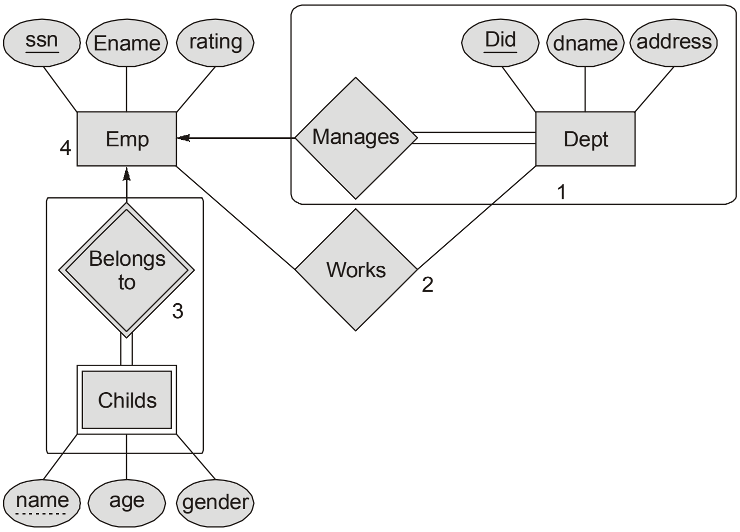
$$32\, P \leq 532$$

$$P = \left\lfloor \frac{532}{32} \right\rfloor = 16$$

Maximum index nodes in index mean min fill factor



21. (d)



Emp (ssn, Ename, rating)
Dept_manages (did, dname, address, ssn)
Works (ssn did)
Childs belongs to (ssn name, age, gender)

22. (a)

- Only serial schedules $T_1 \rightarrow T_2$, $T_2 \rightarrow T_1$ are conflict serializable.
- None of non serial schedules are conflict serializable.

23. (b)

$${}^5C_2 + {}^5C_3 + {}^5C_4 + {}^5C_5 = 26$$

24. (b)

The output Table will be

Dealer-No.	Color-id
D_2	C_2
D_7	C_3
D_2	C_5
D_7	C_6

25. (a)

$$\text{Content of index <key, BP>} = 6 + 10 = 16$$

$$\text{Block factor of database} = \frac{512}{16} = 32$$

$$\text{Number of block in database} = \frac{8192}{32} = 256$$

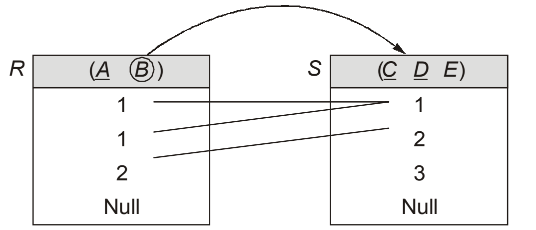
In first level entry for each record,

$$\text{Number of blocks in first level} = \frac{\text{Number of Database Block}}{\text{Entry size of 1st level}} = \left\lceil \frac{256}{32} \right\rceil = 8$$

In second level

$$\text{Number of blocks in second level} = \frac{\text{Number of 1st level Block}}{\text{Entry size of 2nd level}} = \left\lceil \frac{8}{32} \right\rceil = 1$$

26. (b)



Null value of *B* column record not references to any record of *S*. Remaining records of *R* references to atmost one record of *S*.

27. (c)

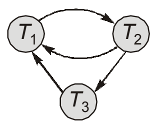
$\{t \mid \exists r \in$ student $(r[\text{ID}] = t[\text{ID}]) \wedge (\forall u \in$ course $(u[\text{dept\_name}] =$ "CS" $\Rightarrow \exists\, s \in$ takes $(t[\text{ID}] = s[\text{ID}] \wedge s[\text{course\_id}] = u[\text{course\_id}])))\}$ will results all students who have taken all courses offered in the CS department. Since we know that $P \Rightarrow Q \equiv$ not $P \vee Q$, so option (b) is also true.

28. (a)

In wait-die scheme, when transaction T_i request a data items currently held by T_j, T_i is allowed to wait only if it has a time stamp smaller then that of T_j otherwise T_i is rolled back (die). Here process *P* is running so it has time stamp less than process *Q* now if process *P* need a resource held by process *Q* then process *P* has to wait.

29. (d)

Checking for conflict serializable:



Cycle is present
So not conflict serialiazable

Since their is blind write between W_2 (a) to W_3 (a), so it may be view serializable.

Checking for view serializability:

1. Final write: $a = T_1,\ b = T_3$ (1)
2. Initial read: $a = T_1,\ T_2\ b = T_3,\ c = T_1$ (2)
3. Write read: No write read

$(T_2, T_3) \rightarrow T_1$ from (1)

$T_1 \rightarrow T_2, T_3$ from (2)

Both at a time not possible, so not view serializable.

30. (b)

If we insert keys 45,48,55 in same order, then on insertion of key 55, root will be overflow and new level will be created.

■■■■