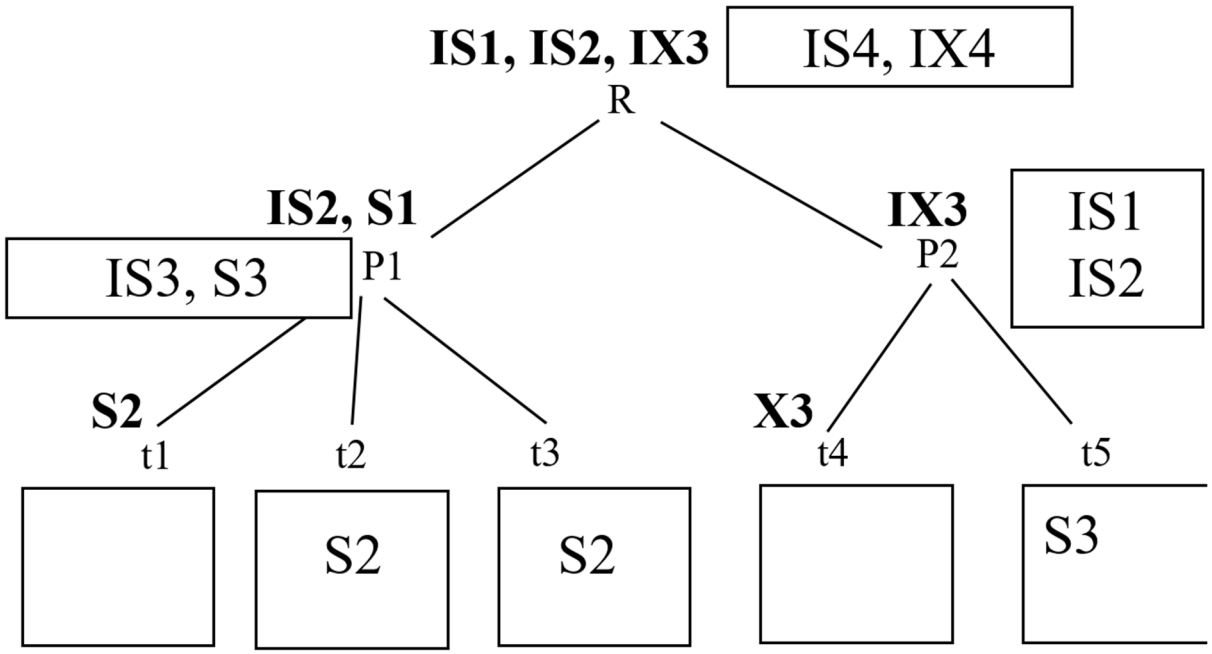
Section A

Question 1.



Question 2

A

B X = 20/100
Y = 0, 30, 40

C No problem

Log 1

< T_1, Start >

< T_2, Start >

< T_1, X, 0, 10 >

< T_2, **X**, **10**, 20 > ⇐ **incomplete log record IC1**

< Checkpoint Start>

< **T1**, Y, **0**, 30 > ⇐ **incomplete log record IC2**

< T_3, Start>

< T_1, Y, 30, 40 >

< Checkpoint End>

< T_1, commit >

< T_3, X, **20**, 100 > ⇐ **incomplete log record IC3**

SYSTEM CRASH AT THIS POINT !!!!!

A

B X = 10/100
Y = 20/30/40

C Yes. Schedule is not recoverable as there is a dirty read (T1 reads Y from T2 which aborted)

Log 2

< T_1, Start >

< T_2, Start >

< T_1, X, 0, 10 >

< T_2, **Y**, **0**, 20 > ⇐ **incomplete log record IC1**

< Checkpoint Start>

< **T1**, Y, **20**, 30 > ⇐ **incomplete log record IC2**

< T_3, Start>

< T_1, Y, 30, 40 >

< Checkpoint End>

< T_1, commit >

< T_3, X, **10**, 100 > ⇐ **incomplete log record IC3**

SYSTEM CRASH AT THIS POINT !!!!!

A B and C = same as Log 2

Log 3

< T_1, Start >

< T_2, Start >

< T_1, X, 0, 10 >

< T_2, **Y**, **0**, 20 > ⇐ **incomplete log record IC1**

< Checkpoint Start>

< **T2**, Y, **20**, 30 > ⇐ **incomplete log record IC2**

< T_3, Start>

< T_1, Y, 30, 40 >

< Checkpoint End>

< T_1, commit >

< T_3, X, **10**, 100 > ⇐ **incomplete log record IC3**

SYSTEM CRASH AT THIS POINT !!!!!

Section B

1. D. (A) is FALSE. Consider R = {(1,0,2), (3,0,4)}. The left side contains tuples (1,0,4) and (3,0,2) that are not in the right side, R. (B) is FALSE. Consider R = {(1,0,2), (1,0,4)}. The left side contains tuples (1,0) and (1,0) but the right side contains (1,0). (C) is TRUE.
2. 20 tuples. 1 page (since 1 attribute only)
3. Each odd value of b in R has 80 occurrences. Each even value has 20 occurrences. Similarly, each odd value of b in S has 64 occurrences, while even value has 16 occurrences. So, joining on b only results in 10*(80*64) + 10*(20*16) = 54400. Additional condition on c results in 54400/200 = 272.
4. 272*5000/200/2 = 3400
5. B
6. (RS)U
7. H
8. E (None)
9. E
10. G
11. 4. First list all the schedules equivalent to the serial schedule T1 T2:

    r1(X) r1(Y) w1(Y) w1(X) r2(Y) w2(Y) r2(X) w2(X)
    r1(X) r1(Y) w1(Y) r2(Y) w1(X) w2(Y) r2(X) w2(X)
    r1(X) r1(Y) w1(Y) r2(Y) w2(Y) w1(X) r2(X) w2(X)

    Then list all the schedules equivalent to T2 T1:

    r2(Y) w2(Y) r2(X) w2(X) r1(X) r1(Y) w1(Y) w1(X)

12. J
13. C
14. G
15. E. 1 waiting (T1 -> T2), 2 aborted (T3 and T4)
16. C. 2 waiting (T4 -> T3 -> T1, 1 aborted (T2)
17. E
18. Void. No correct answer. All were wrong. A – at least 2 schedules (e.g., T1S T2S T1V T2V T1F T2F and swap the last two). B. at least 2 schedules. D. Not possible to have 1. Same for C.
19. Empty set
20. C
21. H. A is wrong because internal node should also be modified, etc. Same for D.