1. Consider the two following transaction schedules and explain why they are or are not serializable and in which order: (2×10 points)
   a) \( r_1(A) ; r_2(B) ; w_1(A) ; r_3(A) ; w_2(B) ; w_3(A) ; r_1(B) ; w_1(B) \)

   [Write your answer here]

   [Write your answer here]

   [Write your answer here]

   [Write your answer here]

   [Write your answer here]

   b) \( r_1(A) ; r_2(A) ; w_1(A) ; w_2(A) ; w_2(C) ; r_1(B) ; w_1(B) \)

   [Write your answer here]

   [Write your answer here]

   [Write your answer here]

   [Write your answer here]

   [Write your answer here]

2. In the UNDO approach for managing transactions,
   a) When can the <COMMIT> record be written to disk? (10 easy points)

   [Write your answer here]

   b) Why? (10 points)

   [Write your answer here]

   [Write your answer here]

   [Write your answer here]

   [Write your answer here]
3. Consider the two tables EMPLOYEE (EID, ENAME, ESALARY, EPLANTID, ...) and PLANT (PLANTID, PNAME, PCITY, PSTATE) where:

- EID is the unique ID of an employee, ENAME, his or her full name, ESALARY, his or her salary, EPLANTID the unique ID of the plant where he or she is working, ...
- PLANTID the unique ID of a plant PNAME located in PCITY in PSTATE, ...

and the following SQL query:

```
SELECT ENAME, ESALARY
FROM EMPLOYEE, PLANT
WHERE EPLANTID = PLANTID AND ESALARY > 300000 AND PSTATE = "NM"
```

a) What would be your naïve execution plan for this request? (10 points)

(Hint: define at each step a temporary table.)

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b) What would be a better execution plan? (10 points)

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(c) What would change in your plan if the query WHERE clause was: (10 points)

WHERE EPLANTID = PLANTID AND ESALARY < 300000 AND PSTATE = "NM"

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4. What does two-phase locking require? (5 points)

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Name a special case where two-phase locking is replaced by less stringent conditions. (5 points)
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5. Consider two transactions $T_1$ and $T_2$ that read and update the same entity $A$. Assume that $T_1$ tries to update $A$ while we have $TS(T_1) \geq RT(A)$, $TS(T_1) \geq WT(A)$, and $C(A) = 0$

What should the scheduler do? (5 points) ___________________________________________________

Why? (5 points) _________________________________________________________________________
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6. Explain why the wound-wait scheme eliminates all potential deadlocks (10 points)

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