1) **DB Anomalies:**

Find if there exist any anomalies in the following schedules. Specify the type of anomalies found (if any). Show where in the schedule anomalies exist.

a) r3(x); r1(x); r2(x); r3(z); r2(y); w3(z); w2(y); r2(z), r1(z); a1; c2; c3 (10 pts)
b) r1(x); r2(z); r3(x); w3(x); r3(z); r1(y); r2(x); w3(z); r2(y); w2(y); r1(y); c3; c1; c2 (10 pts)
c) r1(x); w1(x); r4(x); r3(x); r2(y); r2(x); r1(y); w2(x); r3(y); c1; w4(x); w3(y); c2; c4; c3 (10 pts)
d) r1(x); r2(x); w2(x); r1(x); w1(x); w3(y); r3(x); r2(y); w3(y); r3(y); a1; c3; c2 (10 pts)

2) **Serializability**

Check if the following schedules are conflict serializable (CSR) and/or view serializable (VSR). Show all your work. Explain your answers clearly.

a) w5(y); r5(z); w3(x); r2(y); w1(y); w3(z); w4(x) In case of serializability, for possible equivalent serial schedule(s), which transaction could be the first transaction? (10 pts)
b) r1(u); r4(v); r5(x); r6(y); w1(z); w2(z); r5(u); w5(x); w3(y); w3(v); r2(v); w3(u); w5(z) In case the schedule is CSR and/or VSR, write down one possible equivalent serial schedule. (10 pts)
c) *r1(z);* w5(y); r5(z); w3(x); r2(y); *w5(x);* w1(y); w3(z); w4(x) In case the schedule is CSR and/or VSR, write down one possible equivalent serial schedule. (10 pts)

3) **Two-Phase Lock (2PL):**

Verify whether the following schedule is consistent with 2PL. (30pts)
r1(y); r3(z); r1(x); r2(z); r3(y); r2(x); r1(x); w1(x); w2(y); w3(z); w1(y); r1(z)