For each of the following schedules, determine if it is serial, strict, ACR and/or recoverable.

S1: r1(A) r1(B) w1(A) r2(A) w2(C) c2 w1(B) c1

S2: r1(x) r2(z) r1(z) r3(x) r3(y) w1(x) c1 w3(y) c3 r2(y) w2(z) w2(y) c2

S3: r1(x) r2(z) r1(z) r3(x) r3(y) w1(x) w3(y) r2(y) w2(z) w2(y) c1 c2 c3

S4: r1(x) r2(z) r3(x) r1(z) r2(y) r3(y) w1(x) w2(z) w3(y) w2(y) c3 c2

S6: r1(R) r2(S) w1(U) r4(T) w5(R) r2(U) w2(U) r3(V) r2(V) w5(R) c1 r3(U) w5(U) r4(R) c4 r5(V) a3 w5(R) r2(U) c2 a5

Recoverable schedule:
No transaction T commits until all transactions that have written something that T reads have committed.
T commits after T’ if T has read any data item written by T’.

non-recoverable schedule: w1(a) r2(a) c2 a1, T2 should abort, but can't since it already committed.

ACR schedule:
Every transaction reads only items written by committed transactions.
No transaction reads anything written by an active transaction.
cascading abort: w1(a) r2(a) a1, T2 will have to abort due to T1 abort

Strict schedule:
A transaction can neither read nor write a data item until the last transaction that wrote that data item commits or aborts.
No transaction can read or write anything that was written by an active transaction.

non-strict: b1 b2 w1(a) w2(a) a2
strict: b1 b2 w1(a) c1 w2(a) a2
Determine if each of the following schedules is legal under each of the following locking protocols:

- basic two-phase locking
- conservative two-phase locking
- strict two-phase locking

a) s1(A), x1(B), r1(A), x2(C), s2(A), r2(A), w1(B), u1(B), w2(C), u1(A), c1, u2(C), u2(A), c2

b) s1(A), x1(B), r1(A), u1(A), x2(C), s2(A), r2(A), w1(B), u1(B), w2(C), c1, u2(C), u2(A), c2

c) s1(A), x1(B), r1(A), s2(A), r2(A), u2(A), w1(B), u1(B), x2(C), w2(C), u1(A), c1, u2(C), c2

d) x2(X), r2(X), x2(Z), w2(Z), u2(Z), s1(X), r1(X), u1(X), s1(Z), r1(Z), u1(Z), w2(X), u2(X), c1, c2

e) x2(X), r2(X), x2(Z), w2(Z), u2(Z), s1(Z), r1(Z), u2(X), s1(X), r1(X), u1(Z), u1(X), c1, c2