

Q. 1.99

a. Are they multiples of 3?

1) Block 1 $S=0, B_2=1, B_3=0, B_4=1, B_5=1, B_6=0, B_7=0, B_8=2$,
Not in L_1

2) $B_1=0, B_2=0, B_3=0, B_4=2, B_5=0, B_6=2, B_7=0, B_8=2, B_9=2$
Not in L_1

3) $B_1=0, B_2=0, B_3=2, B_4=0, B_5=0, B_6=2, B_7=2, B_8=1, B_9=1$
Not in L_1

4) $B_1=0, B_2=0, B_3=0, B_4=0, B_5=0, B_6=0, B_7=0, B_8=0, B_9=0$
Yes, this is in L_1

b. $w/3 = R0 = \sum_{k=1}^n (-1)^k v_k$ is mult 3 $= \sum_{k=1}^n (-1)^k v_k^R$

A binary string is divisible by 3, if the difference of nonzero even values and nonzero odd values is divisible by 3.

Since L_2 and L_3 only use the same w , except L_3 uses w^R & k reversed, the the absolute value of $|\sum_{k=1}^n (-1)^k v_k|$, L_2 and L_3 have are equivalent languages.

c. The automaton shown seen in class accepts languages L_1, L_2, L_3