1. (b)

I) 0-1 distribution: Number of zeroes: 15 } difference at most 1
Number of ones: 16 }

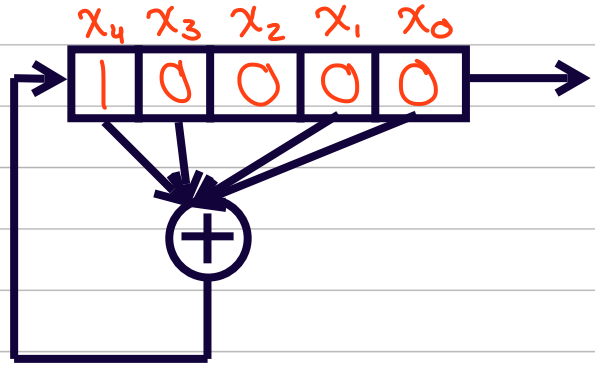
II) Run distribution:

| Length | 0-run | 1-run |
|---|---|---|
| 1 | $2^{5-(1)-2} = 4$ | $2^{5-(1)-2} = 4$ |
| 2 | $2^{5-(2)-2} = 2$ | $2^{5-(2)-2} = 2$ |
| $n-2 = 3$ | 1 | 1 |
| $n-1 = 4$ | 1 | 0 |
| $n = 5$ | 0 | 1 |
| Total | $2^{5-2} = 8$ | $2^{5-2} = 8$ |

III) Autocorrelation: $C(\tau=0) = 31 = N$
$C(\tau \neq 0) = K \neq N$

IV) Initial States: first n bits of m-sequence in reverse order
=> $x_4$ $x_3$ $x_2$ $x_1$ $x_0$
1 0 0 0 0

V) LFSR Sketch:




(c) An n-bit LFSR should be able to produce at most $2^n - 1$ n-bit pseudorandom numbers. Given $n=5$, this LFSR is capable of producing at most 31 5-bit pseudorandom numbers.