

Question 1

a

Assuming the rules are to stuff a 0 after five consecutive 1's, and to encapsulate the entire message with 01111110, the bits streamed are

0111111010001111101010001111100110111110.

b

The original bits are 1111111000111111.

Question 2

a

The encoded message is 011000111011 as derive from follows

	1 (p1)	2 (p2)	3	4 (p3)	5	6	7	8 (p4)	9	10	11	12
	0	1	1	0	0	0	1	1	1	0	1	1
p1	x		x		x		x		x		x	
p2		x	x			x	x			x	x	
p3				x	x	x	x					x
p4								x	x	x	x	x

b

i

Parity bits $p1$ and $p4$ are wrong, which suggests a flipped bit at $(1001)_2 = (9)_{10}^{th}$ bit

ii

Parity bits $p1$, $p2$ and $p4$ are wrong, which suggests a flipped bit at $(1011)_2 = (11)_{10}^{th}$ bit

3

a

As $C(x) = 10101$, the long division of 10110 against 10101 yields a remainder of 1111. Thus, the encoded message is 101101111.

b

i

The remainder is non-zero, the message is corrupted.

ii

The remainder is zero, the message is intact.

4

Destination	Cost	Next Hop
A	9	D
B	5	B
C	8	E
D	5	D
E	4	E
F	9	E

5

$$time = (2^{64} \times 8) / (100 \times 1024^4) = 1342177 \text{ s} = 15 \text{ days}$$

6

According to figure 1, the domain was registered on 02-Jun-1986 and will expire on 31-Jul-2024. It contains 3 DNS servers: DNS-NC1-01.OIT.DUKE.EDU, DNS-AUTH-01.OIT.DUKE.EDU, DNS-AUTH-02.OIT.DUKE.EDU

7

The acquired response is as follows in figure 2.

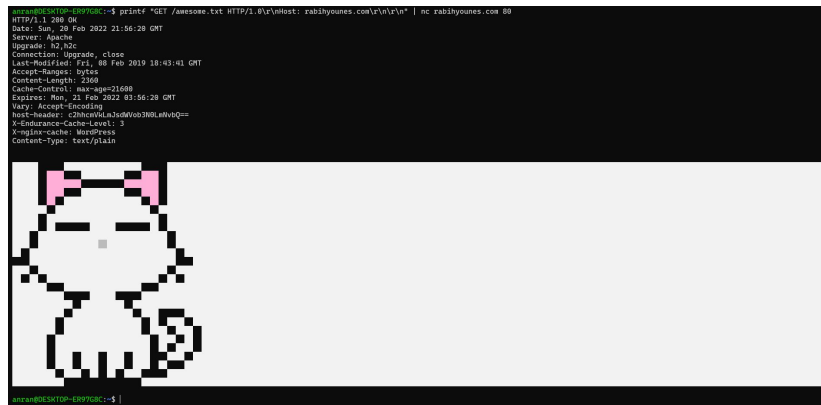


Figure 2: acquired message from <http://rabiyounes.com/awesome.txt>

```
Domain Name: DUKE.EDU

Registrant:
    Duke University
    905 W. Main Street, Suite 18B
    Suite 2106
    Durham, NC 27701
    USA

Administrative Contact:
    Domain Administrator
    Duke University
    334 Blackwell St.
    Suite 2106
    Durham, NC 27701
    USA
    +1.9196845300
    datacon-hostmaster@duke.edu

Technical Contact:
    Domain Administrator
    Duke University
    334 Blackwell St.
    Suite 2106
    Durham, NC 27701
    USA
    +1.9196842200
    datacon-hostmaster@duke.edu

Name Servers:
    DNS-NC1-01.OIT.DUKE.EDU
    DNS-AUTH-01.OIT.DUKE.EDU
    DNS-AUTH-02.OIT.DUKE.EDU

Domain record activated:    02-Jun-1986
Domain record last updated: 02-Jun-2021
Domain expires:            31-Jul-2024
```

Figure 1: whois lookup result for duke.edu, from <https://www.whois.com/>