

Ex6A:

1) Chia modulo-2

Ta thực hiện chia nhị phân (mod-2) — mỗi lần gấp bit 1 ở vị trí hiện tại thì XOR khối bằng độ dài generator.

Bắt đầu với 1001100000. Generator = 1011 (4 bit).

Từng bước (ghi vị trí bắt đầu, khối 4 bit đang xét, kết quả XOR 4 bit, trạng thái dãy sau khi XOR):

1. Vị trí 0: khối = 1001
1001 XOR 1011 = 0010
Dãy trở thành: 0010100000
2. Vị trí 1: khối (vị trí 1..4) = 0101 — **bỏ qua** vì bit dẫn ở vị trí 1 là 0 (không chia)
Dãy vẫn: 0010100000
3. Vị trí 2: khối = 1010
1010 XOR 1011 = 0001
Dãy trở thành: 0000010000
4. Vị trí 3: khối = 0010 — **bỏ qua** (bit dẫn = 0)
Dãy vẫn: 0000010000
5. Vị trí 4: khối = 0100 — **bỏ qua** (bit dẫn = 0)
Dãy vẫn: 0000010000
6. Vị trí 5: khối = 1000
1000 XOR 1011 = 0011
Dãy trở thành: 0000000110
7. Vị trí 6: khối = 0110 — **bỏ qua** (bit dẫn = 0)
Kết thúc, dãy cuối cùng: 0000000110

Ở đây phần dư là **3 bit cuối cùng** (do generator độ 3): 110.

2) Kết luận — CRC

- **CRC (phần dư)** = 110.
- **Khung truyền (transmitted frame)** = dữ liệu gốc + CRC = 1001100 + 110 = **1001100110**.

3) Kiểm tra ở phía nhận (receiver)

Bên nhận nhận chuỗi 1001100110. Ta thực hiện chia modulo-2 chuỗi này cho 1011. Nếu phần dư = 000 (tất cả bit 0) thì không có lỗi được phát hiện.

Thực hiện chia (tương tự như trên) cho 1001100110 cho 1011.

Bên nhận lấy khung 1001100110 và chia cho cùng generator 1011. Nếu phần dư = 000 thì hợp lệ.

Lab6A:

1

```
✗ Ethernet II, Src: AmbitMicrosy_a9:3d:68 (00:d0:59:a9:3d:68), Dst: LinksysGroup_da:af:73 (00:06:25:da:af:73)
  > Destination: LinksysGroup_da:af:73 (00:06:25:da:af:73)
  > Source: AmbitMicrosy_a9:3d:68 (00:d0:59:a9:3d:68)
    Type: IPv4 (0x0800)
    [Stream index: 1]

    .... 0101 = Header Length: 20 bytes (5)
  > Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
    Total Length: 672
    Identification: 0x00fa (250)
  > 010. .... = Flags: 0x2, Don't fragment
    ...0 0000 0000 0000 = Fragment Offset: 0
    Time to Live: 128
    Protocol: TCP (6)
    Header Checksum: 0xbfc8 [validation disabled]
    [Header checksum status: Unverified]
    Source Address: 192.168.1.105
    Destination Address: 128.119.245.12
    [Stream index: 1]
✗ Transmission Control Protocol, Src Port: 1058, Dst Port: 80, Seq: 1, Ack: 1, Len: 632
  Source Port: 1058
  Destination Port: 80
  [Stream index: 1]
  [Stream Packet Number: 4]
  > [Conversation completeness: Incomplete, DATA (15)]
    [TCP Segment Len: 632]
    Sequence Number: 1 (relative sequence number)
    Sequence Number (raw): 1695848871
    [Next Sequence Number: 633 (relative sequence number)]
    Acknowledgment Number: 1 (relative ack number)
    Acknowledgment number (raw): 2896510900
    0101 .... = Header Length: 20 bytes (5)
  > Flags: 0x018 (PSH, ACK)
    Window: 64240
```

A Source: AmbitMicrosy_a9:3d:68 (00:d0:59:a9:3d:68) (A)

B Destination: 00:06:25:da:af:73 (R)

C Type: IPv4 (0x0800)

D 54 bytes: Ethernet 14 bytes, IP 20 bytes, TCP 20 bytes. (G)

2

12 17.498935	128.119.245.12	192.168.1.105	TCP	1514 80 → 1058 [ACK] Seq=1 Ack=633 Win=69
13 17.500025	128.119.245.12	192.168.1.105	TCP	1514 80 → 1058 [ACK] Seq=1461 Ack=633 Win
14 17.500069	192.168.1.105	128.119.245.12	TCP	54 1058 → 80 [ACK] Seq=633 Ack=2921 Win
15 17.527057	128.119.245.12	192.168.1.105	TCP	1514 80 → 1058 [ACK] Seq=2921 Ack=633 Win
16 17.527422	128.119.245.12	192.168.1.105	HTTP	489 HTTP/1.1 200 OK (text/html)
17 17.527457	192.168.1.105	128.119.245.12	TCP	54 1058 → 80 [ACK] Seq=633 Ack=4816 Win

▼ Transmission Control Protocol, Src Port: 80, Dst Port: 1058, Seq: 1461, Ack: 633, Len: 1460

- Source Port: 80
- Destination Port: 1058
- [Stream index: 1]
- [Stream Packet Number: 7]
- [Conversation completeness: Incomplete, DATA (15)]
- [TCP Segment Len: 1460]
- Sequence Number: 1461 (relative sequence number)
- Sequence Number (raw): 2896512360
- [Next Sequence Number: 2921 (relative sequence number)]
- Acknowledgment Number: 633 (relative ack number)
- Acknowledgment number (raw): 1695849503
- 0101 = Header Length: 20 bytes (5)**
- Flags: 0x010 (ACK)
- Window: 6952
- [Calculated window size: 6952]
- [Window size scaling factor: -2 (no window scaling used)]
- Checksum: 0xdd82 [unverified]
- [Checksum Status: Unverified]

5 8.971488	192.168.1.105	199.2.53.206	TCP	62 [TCP Retransmission] 1057 → 631 [SYN]
6 13.542974	CnetTechnolo_73:8d:... Broadcast		ARP	60 Who has 192.168.1.117? Tell 192.168.1
7 17.444423	192.168.1.105	128.119.245.12	TCP	62 1058 → 80 [SYN] Seq=0 Win=64240 Len=0
8 17.465902	128.119.245.12	192.168.1.105	TCP	62 80 → 1058 [SYN, ACK] Seq=0 Ack=1 Win=
9 17.465927	192.168.1.105	128.119.245.12	TCP	54 1058 → 80 [ACK] Seq=1 Ack=1 Win=64240
10 17.466468	192.168.1.105	128.119.245.12	HTTP	686 GET /ethereal-labs/HTTP-ethereal-lab-
11 17.494766	128.119.245.12	192.168.1.105	TCP	60 80 → 1058 [ACK] Seq=1 Ack=633 Win=695
12 17.498935	128.119.245.12	192.168.1.105	TCP	1514 80 → 1058 [ACK] Seq=1 Ack=633 Win=695
13 17.500025	128.119.245.12	192.168.1.105	TCP	1514 80 → 1058 [ACK] Seq=1461 Ack=633 Win=
14 17.500069	192.168.1.105	128.119.245.12	TCP	54 1058 → 80 [ACK] Seq=633 Ack=2921 Win=
15 17.527057	128.119.245.12	192.168.1.105	TCP	1514 80 → 1058 [ACK] Seq=2921 Ack=633 Win=
16 17.527422	128.119.245.12	192.168.1.105	HTTP	489 HTTP/1.1 200 OK (text/html)
17 17.527457	192.168.1.105	128.119.245.12	TCP	54 1058 → 80 [ACK] Seq=633 Ack=4816 Win=

[Stream index: 1]

[Stream Packet Number: 8]

- [Conversation completeness: Incomplete, DATA (15)]
- [TCP Segment Len: 0]
- Sequence Number: 633 (relative sequence number)
- Sequence Number (raw): 1695849503
- [Next Sequence Number: 633 (relative sequence number)]
- Acknowledgment Number: 2921 (relative ack number)
- Acknowledgment number (raw): 2896513820
- 0101 = Header Length: 20 bytes (5)**
- Flags: 0x010 (ACK)
- Window: 64240
- [Calculated window size: 64240]
- [Window size scaling factor: -2 (no window scaling used)]
- Checksum: 0x7fe6 [unverified]
- [Checksum Status: Unverified]
- Urgent Pointer: 0
- [Timestamps]
- [SEQ/ACK analysis]

- A. 00:06:25:da:af:73 — thuộc R
B. 00:d0:59:a9:3d:68 — thuộc A
C. 0x0800 — IPv4
D. Byte offset đến ký tự 'O' = 54 (bytes). Header trước payload: Ethernet 14 bytes, IP 20 bytes, TCP 20 bytes.

3

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v Frame 1: 42 bytes on wire (336 bits), 42 bytes captured (336 bits)
  Encapsulation type: Ethernet (1)
  Arrival Time: Aug 29, 2004 00:19:20.157130000 SE Asia Standard Time
  UTC Arrival Time: Aug 28, 2004 17:19:20.157130000 UTC
  Epoch Arrival Time: 1093713560.157130000
  [Time shift for this packet: 0.000000000 seconds]
  [Time delta from previous captured frame: 0.000000000 seconds]
  [Time delta from previous displayed frame: 0.000000000 seconds]
  [Time since reference or first frame: 0.000000000 seconds]
  Frame Number: 1
  Frame Length: 42 bytes (336 bits)
  Capture Length: 42 bytes (336 bits)
  [Frame is marked: False]
  [Frame is ignored: False]
  [Protocols in frame: eth:ethertype:arp]
  [Coloring Rule Name: ARP]
  [Coloring Rule String: arp]
v Ethernet II, Src: AmbitMicrosy_a9:3d:68 (00:d0:59:a9:3d:68), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
  > Destination: Broadcast (ff:ff:ff:ff:ff:ff)
  > Source: AmbitMicrosy_a9:3d:68 (00:d0:59:a9:3d:68)
  Type: ARP (0x0806)
  [Stream index: 0]
v Address Resolution Protocol (request)
  Hardware type: Ethernet (1)
  Protocol type: IPv4 (0x0800)
  Hardware size: 6
  Protocol size: 4
  Opcode: request (1)
  Sender MAC address: AmbitMicrosy_a9:3d:68 (00:d0:59:a9:3d:68)
  Sender IP address: 192.168.1.105
  Target MAC address: 00:00:00_00:00:00 (00:00:00:00:00:00)
  Target IP address: 192.168.1.1
```

- A. 00:d0:59:a9:3d:68 , ff:ff:ff:ff:ff:ff
- B. 0x0806
- C. 20
- D. 0x0001
- E. 192.168.1.105
- F. 00:00:00:00:00:00 , 192.168.1.1

- A. 00:06:25:da:af:73, 00:d0:59:a9:3d:68
 - B. 0x0806
 - C. 20
 - D. 0x0002
 - E. 192.168.1.1
 - F. 00:d0:59:a9:3d:68, 192.168.1.105