*University of M'sila*
*Faculty of Mathematics and Computer Science*
*Department of Computer Science*

# Written Exam in "Computer Networks"

*May 16th 2026* *08:30 – 10:30*

**Last name:** ……

**First name:** ……

**Group:** ……

**Mark:** ……

## Instructions

- Use the provided sheets. Do not use your own paper.
- Do not use a red pen.
- Mobile phones, smart watches, **calculators**, and other electronic devices are **not allowed**.
- Turn off your mobile phones.
- No communication between candidates is allowed during the exam.
- Cheating or academic dishonesty will result in disciplinary action.

| **Exercises** | 1 | 2 | 3 | 4 | 5 | **Total** |
|---|---|---|---|---|---|---|
| **Maximum Points** | 4 | 4 | 3 | 4 | 5 | 20 |
| **Achieved Points** | | | | | | |

## Exercise 1 (Basic Concepts): Points: ..... of 4 pts

0.5 pt

1) Which OSI layer introduces physical addressing?

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1 pt

2) What is the role of an "Access Point" in a LAN ?

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1 pt

3) According to the OSI model, which networking layers are responsible for the following operations :

Segmentation and reassembly : .....

Clock Synchronization : .....

Data Fragmentation : .....

Data Encryption/Decryption : .....

0.5 pt

4) Provide two application examples of using TCP protocol by the transport layer.

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1 pt

5) Why is framing necessary during data transmission?

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## Exercise 2 : Points: ..... of 4 pts

0.5 pt

1) A station S is applying the "Flag bytes with byte stuffing" framing method to send the following stream of characters :

**FLAG E X ESC A M**

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0.5 pt

2) A station R is receiving the following frame from another station S that applied "Starting and ending flag bytes, with bit stuffing" :

01111110 0000010 11111001 11110000 01111101 01111110

*Question* : Determine the original data before applying this framing method.

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Last name : First name :

2 pts

3) A sender wants to send a data frame 10010011 using CRC scheme for error control with polynomial generator : $X^3 + X^2$ . Determine the codeword that will be transmitted.

1 pt

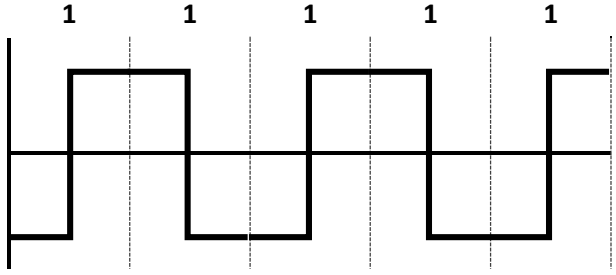
4) Consider a block coding scheme used for error control. What is the required hamming distance of this scheme in order to correct up to three transmission errors?

## Exercise 3 :

Points: ..... of 3 pts

1 pt

1) Determine the line encoding scheme used to provide the following signal curve

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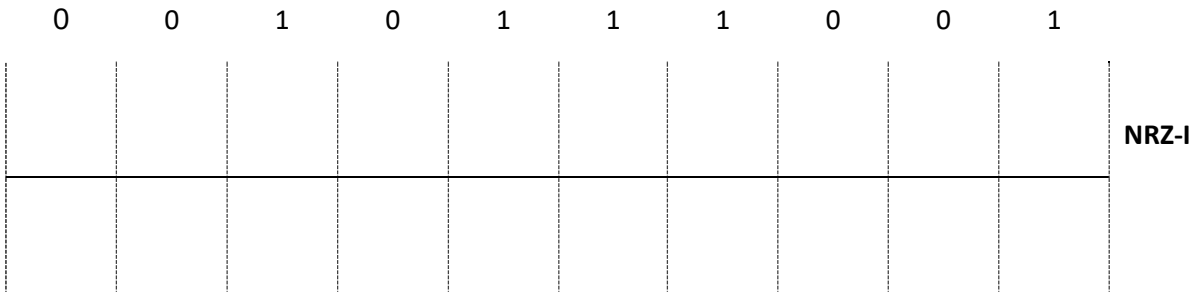
2 pts

2) Assuming that the last signal level has been positive, draw the signal curve of the following bit sequence with NRZ-I : 0010111001




## Exercise 4 : Points: ..... of 4 pts

2 pts

1) Given a LAN with the following address : **192.168.1.0 /26**

Among the following IP addresses, determine which ones are invalid IPs (cannot be assigned to any host of this LAN) and explain why (if invalid).

| IP address | Valid / Invalid | Why ? |
|---|---|---|
| **192.168.1.4** | | |
| **192.168.1.100** | | |
| **192.168.1.255** | | |
| **192.168.1.63** | | |
| **192.168.1.0** | | |

2 pts

2) Consider two stations A and B belonging to the same LAN. Among the following scenarios, determine the output of a ping from station A to station B.

***Scenario 1*** : A : 10.0.0.255 B : 10.255.255.0

Ping output (Succes / Fail): .....

Explanation : .....

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***Scenario 2*** : A : 192.168.0.1/24 B : 192.168.1.1/24

Ping output (Succes / Fail): .....

Explanation : .....

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Last name : First name :

## Exercise 5 : Points: ..... of 5 pts

Given the network of the faculty company with IP block : 192.168.1.0 /24

1 pt

1) Determine the range of IP addresses (first host address, last host address)

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2) Split this network into subnets of equal sizes, each subnet should have 62 hosts.

*Questions*:

0.5 pt

a) Which method should be used to achieve this splitting ? (Explain why)

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1 pt

b) How many subnets will be created ? (Explain)

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2.5 pts

c) Using the method stated in question (a), determine the following information for each subnet:

Subnet Mask, Subnet Address, First Host Address, Last Host Address, Broadcast Address

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