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| **National University of Computer and Emerging Sciences, Lahore Campus** | | | | |
| C:\Users\saif\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.Word\final design.jpg | **Course Name:** | **Digital Logic Design** | **Course Code:** | **EE227** |
| **Degree Program:** | **BS-CS** | **Semester:** | **Spring 2022** |
| **Due Date:** |  | **Weight** |  |
| **Section:** |  | **Page(s):** |  |
| **Exam Type:** |  | **Total Marks:** |  |
| **Student : Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Roll No.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Section:\_\_\_\_\_\_\_** | | | | |
| **Instruction/Notes:** | Attempt all questions. Programmable calculators are not allowed. | | | |

**Practice Questions**

**Question 1: Arithmetic operation with signed numbers**

1. 33+15 =(00100001)+(00011001)=
2. 87+(-27)=( 01010111)+( 11100101)=

**Question 2: Binary multiplication:**

1. (1010.11)×(110)=
2. (1011.11) ×(1101)=
3. (1101.01) ×(110.01)=

**Question 3: Hexadecimal multiplication:**

1. F0A×C3=
2. EF12×F56=

**Question 4:** Simplify the following Boolean expression:

* [*AB'*(*C* + *BD*) + *A' B'*]*C*
* *A'BC* + *AB'C'* + *A' B' C'* + *AB'C* + *ABC*
* *(AB* + *AC)'* + *A 'B' C*

**Question 5:**

Text, letter

Description automatically generated

**Question 6:**

Text, letter

Description automatically generated

**Question 7:**

1. A black-and-white image has a resolution of 640x480 pixels. How many bits are required to save this image in computer memory?
2. Repeat part (1) if the image has 256 unique colors (instead of black-and-white).
3. How much memory (in kB) will be needed to save a video clip of 5 minutes if it has a resolution of 640x480 and there are 25 frames per second? (assume 256 colors).
4. A hand-held video player displays 480x320 pixels (picture elements) in each frame of the video. Each pixel requires 2 bytes of memory. Videos are displayed at a rate of 30 frames per second. How many hours of video will fit in a 32 gigabyte memory?

Note:

1 B = 8 bits,

1024 B = 1 kB

1048576 B = 1024 kB = 1 MB

1073741824 B = 1048576 kB = 1024 MB = 1 GB

**Question 8:**

1. What is the largest integer number that can be saved in a 16-bit register? Show your work.
2. What is the smallest integer number that can be saved in a 16-bit register? Show your work.

**Note:** Assume that the numbers in part (a) and (b) are stored in 2's complement form.

1. A small computer has a 16Mx16 memory (16 Mega words of 16 bits each). Compute the total number of binary cells of this memory.

**Question 9:**

Four chairs are placed in a row:

A picture containing text, clock

Description automatically generated

The row may be occupied (“1”) or empty (“0”). Write a logic function F(A, B, C, D) which is 1 if and only if there are no adjacent empty chairs. Implement this function using AND, OR, NOT gates.