NATIONAL SCHOOL OF BUSINESS MANAGEMENT.
BSc (Hons) Software Engineering (PU)
BSc (Hons) Computer Networks (PU)
BSc (Hons) Computer Security (PU)
1st Year 2nd Semester Examination
06th September 2021
CS104.3 – Computer Architecture

Instructions to Candidates

1. Answer ALL questions
2. Time allocated for the examination is five (05) hours (Including downloading and uploading time). Please type your answer unless a diagram is required. Diagrams can be handwritten and attached as a figure.
3. Weightage of Examination: 60% out of final grade
4. Download the paper, provide answers to the questions in a word document.
5. Answer script should be uploaded in PDF Format.
6. The Naming convention of the answer script – Module Code_Subject name_Index No
7. Please upload the document with answers (Answer Script) to the submission link before the submission link expires.
8. Under any circumstances E-mail submissions would not be taken into consideration for marking. Incomplete attempt would be counted as a MISSED ATTEMPT.
9. You must adhere to the online examination guidelines when submitting the answer script to N-Learn.
10. Your answers will be subjected to Turnitin similarity check, hence, direct copying and pasting from internet sources, friend's answers etc. will be penalized.
11. Google diagrams, images are not allowed in the answers.

Question 1 **[20 marks]**

1. Some definitions of engineering define the term "Computer Architecture"; as describing the physical and programming model of a computer but not any utilization. Describe the term Computer Architecture from its component point of view. Use diagrams to assist your answer. (3 marks)
2. Draw a diagram to define the composition of the Computer System and briefly describe each component of it. (3 marks)
3. Explain the functionality of the machine cycle with involvement of main purpose registers. (3 marks)
4. Suppose that following instructions were found at a given locations in the memory:

300	LDA 350
301	SUB 351
….	…
…	….
350	10011
351	1011

   (i). Show the contents of the IR, the PC, the MAR, the MDR, and A after instruction 300. (3 marks)

   (ii). Show the contents of each register ***for each step*** of the fetch-execute cycle performed for instruction 301. (5 marks)
5. John wants to buy a new laptop for his professional work of video editing. If John looking for your advice on selecting a laptop, what guidelines are you going to give john? Explain your answer with updated hardware components. (3 marks)

Question 2 **[20 marks]**

1. Computer systems consist of multiple memory devices; therefore, computer systems employ a memory hierarchy, Explain the memory hierarchy with a suitable diagram by mentioning all the properties. (4 marks)
2. "What is cache memory?" Explain (3 marks)
3. Briefly explain the following terms related to the cache memory. (4 marks)
   - Temporal Locality
   - Spatial Locality
   - Harvard architecture
   - Von Neumann architecture
4. Describe the functionality of MAR, MDR and Address Decoder in data accessing with a suitable diagram. (5 marks)
5. "Secondary Memory Storages can be divided into two categories such as Internal Secondary storages and External Secondary storages." Explain the statement by using suitable examples. (4 marks)

Question 3 **[20 marks]**

1. Construct both logic circuit and the truth table for the following Boolean Expression.
   F = (A+B'+C) . (A'.B')' (3 marks)
2. Construct the Full Adder using logic gates and complete the truth table. (4 marks)
3. Simplify the following Boolean Expressions using either Boolean Logic rules or K-Map.
   a) **F = A. (A' + B)** (5 marks)
   b) **F = (A+C) (AD + AD') + AC + C**
   c) **F= A'B'C' +A'B'C + AB'C' + AB'C**
4. Construct the SOP expression for the following truth table and simplify it up to simplest form and draw the logic circuit. (5 marks)

A	B	C	OUTPUT
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

5. Construct the Gate Exclusive OR(XOR) by only using AND OR NOT gates. (3 marks)

Question 4 **[20 marks]**

1. Briefly describe what is primary memory in the terms of computer architecture. (3 marks)
2. Calculate the capacity of a memory if, address bus width= 32 bits and data bus width= 8 bits. (3marks)
3. In a memory there are 16M addresses. What is the width of the address bus? (3 marks)
4. What are the different techniques of expanding the memory. (3 marks)
5. Construct a 4x16K memory using 1x4k memories. (Draw the block diagram indicating the data bus, address bus, and the other circuit components as necessary) (8marks)

Question 5 **[20 marks]**

1.Explain the difference between combinational logic circuits and sequential logic circuits. (3 marks)

2.Construct SR Latch using only NAND gates, demonstrate all the cases of inputs, and construct the truth table of SR Latch. (4 marks)

3.Explain what is clock signals and what is CPU clocking? (2 marks)

4. Develop SR Latch you create in question 2 into SR Flip-flop, demonstrate all the cases of inputs, and construct the truth table of SR Latch. (5 marks)

5.Explain how a CPU increases its throughput by adopting pipelining use a diagram to assist your answer. (3 marks)

6.What are pipeline hazards and how we can prevent pipeline hazards? (3 marks)