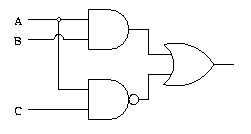
**Marking Scheme**

**2nd Year, First Semester Examination – 2016 - HNDIT - IT 3002 - Computer Architecture (Old)**

Q1.

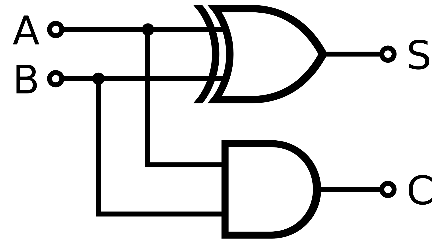
* 1. Write the Boolean expression for the following logic circuit. (05 Marks)



Consider the following truth table.

|  |  |  |
| --- | --- | --- |
| A | B | Result |
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

* 1. Identify the logical operation of the above truth table result (04 Marks)  
     XOR
  2. Give a logic circuit for a half adder (08 Marks)



* 1. Simplify the following Boolean function F using K-Map

F = ABC + A'B'C' + AB'C + ABC' (08 Marks)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| C\AB | 00 | 01 | 11 | 10 |
| 0 | 1 | 0 | 1 | 0 |
| 1 | 0 | 0 | 1 | 1 |

F=AB+AC+A’B’C’

[Total 25]

**Q2.**

* 1. Briefly explain the following :
     1. Instruction Register  
        IR is a register in a computer processor that contains the instruction instruction being executed at the current time.
     2. Flag Register / PSW  
        The FLAGS register is the status register in Intel x86 microprocessors that contains the current state of the processor.
     3. Memory Buffer Register  
        The Memory Address Register (MAR) is a CPU that stores the data being transferred to and from the immediate access store
     4. ALU  
        An arithmetic logic unit (ALU) is a digital circuit that performs integer arithmetic and logical operations. The ALU is a fundamental building block of the central processing unit of a computer.

(12 Marks)

* 1. Briefly explain Opcode ?  
     An opcode (operation code) is the portion of a machine language instruction that specifies the operation to be performed

(5 Marks)

* 1. A CPU capable to perform 64 different instructions. How many bits needed to represent the opcode for this CPU?  
     6 bits

(5 Marks)

* 1. Explain briefly how CPU handles an interrupt operation.  
     An interrupt handler, also known as an interrupt service routine or ISR, is a callback function in microcontroller firmware, an operating system or a device driver, whose execution is triggered by the reception of an interrupt. Interrupt handlers have a multitude of functions, which vary based on the reason the interrupt was generated and the speed at which the interrupt handler completes its task.

(3 Marks)

[Total 25]

Q3.

1. What is mean by instruction pipelining?

An instruction pipeline is a technique used in the design of computers to increase their instruction throughput. The basic instruction cycle is broken up into a series called a pipeline. Rather than processing each instruction, each instruction is split up into a sequence of steps so different steps can be executed concurrently and in parallel.

(5 Marks)

1. State weather the following statements are true or false?
   1. Execution time of an instruction can be increased by hardware upgrade. (True/False)?
   2. Execution time of a program cannot be increased by Pipelining. (True/False)?
   3. We can increase the performance of a CPU by Pipelining. (True/False)?
   4. We can increase the clock speed of a CPU by Pipelining. (True/False)?

(4x2=8 Marks)

1. “How can we increase the performance of a PC. State any 3 ways?  
   Upgrading RAM, Defragging the HDD, Replacing high speed processor, Allocating enough space in C drive.

(3x2=6 Marks)

1. What are the three types of hazards related to pipelining?
   1. Structural Hazards. They arise from resource conflicts when the hardware cannot support all possible combinations of instructions in simultaneous overlapped execution.
   2. Data Hazards. They arise when an instruction depends on the result of a previous instruction in a way that is exposed by the overlapping of instructions in the pipeline.
   3. Control Hazards.They arise from the pipelining of branches and other instructions that change the PC.

(6 Marks)

[Total 25]

Q4.

1. If I = number of instructions in a program, CPI = average cycles per instruction

And T = clock cycle time,

* + 1. Define CPU Execution Time in terms of I, CPI and T  
       Execution Time= I\*CPI\*T

(6 Marks)

Consider the data given below:

Clock Rate = 2 GHz

Average Cycles per Instruction = 3

Number of instructions in a program = 250

* + 1. Calculate clock cycle time?  
       T=

(6 Marks)

* + 1. Calculate the CPU execution time of this program?  
       =250\*3\*

(6Marks)

1. Briefly explain “Seek Time” , “Rotational latency (delay)” and Access time of hard disk drive operation.  
   **The seek time** measures the time it takes the head assembly on the actuator arm to travel to the track of the disk where the data will be read or written.  
   **Rotational latency** (sometimes called rotational delay or just latency) is the delay waiting for the rotation of the disk to bring the required disk sector under the read-write head  
   **The access time** or response time of a rotating drive is a measure of the time it takes before the drive can actually transfer data.

(7 Marks)

[Total 25]

Q5.

1. What is process scheduling?  
   Process scheduling allow more than one process to be loaded into the executable memory at a time and loaded process shares the CPU using time multiplexing.

(4 Marks)

1. Why process scheduling is important?  
   Be fair, Be efficient, Maximize throughput, Minimize response time, Maximize resource use etc..

(5 Marks)

1. What is the difference between preemptive and non-preemptive scheduling?  
   **Non-Preemptive:** Non-preemptive algorithms are designed so that once a process enters the running state (is allowed a process), it is not removed from the processor until it has completed its service time.  
   **preemption** is the act of temporarily interrupting a task being carried out by a computer system, without requiring its cooperation, and with the intention of resuming the task at a later time

(2x4=8 Marks)

1. Describe FCFS and Round Robin scheduling algorithms?  
   **FCFS :** With this algorithm, processes are assigned the CPU in the order they request it.  
   **Round Robin scheduling** : time slices are assigned to each process in equal portions and in circular order, handling all processes without priority

(8 Marks)

[Total 25]