CSIT101: INTRODUCTION TO INFORMATION TECHNOLOGY

FIRST SEMESTER EXAMINATIONS: 2017/2018

MARKING SCHEME

INSRUCTIONS

ANSWER ALL THE QUESTIONS IN THE ANSWER BOOKLET

SECTION A OBJECTIVES: SELECT THE CORRECT ANSWER FOR EACH QUESTION 40 MARKS TOTA.

THERE IS ONLY ONE CORRECT ANSWER IN EACH QUESTION

SECTION B - ANSWER ANY FOUR QUESTIONS FOR 20 MARKS TOTAL

TIME ALLOWED: ***TWO AND A HALF (2½) HOURS***

[60 MARKS TOTAL]

Q1. Simplify the expression below and draw the resulting expressions logic circuit? [5 Marks].

((A + B) + A) V ((B C) . C) + (A C) . (A D + C D)

ANSWER Q1

((A + B) + A) V ((B C) • C) V (A C) • (A D + C D)

(A + B) V A V (B C) • C V A C • (A D + C D)

(A + B) V A V (B + C) • C V A C A D + A C C D

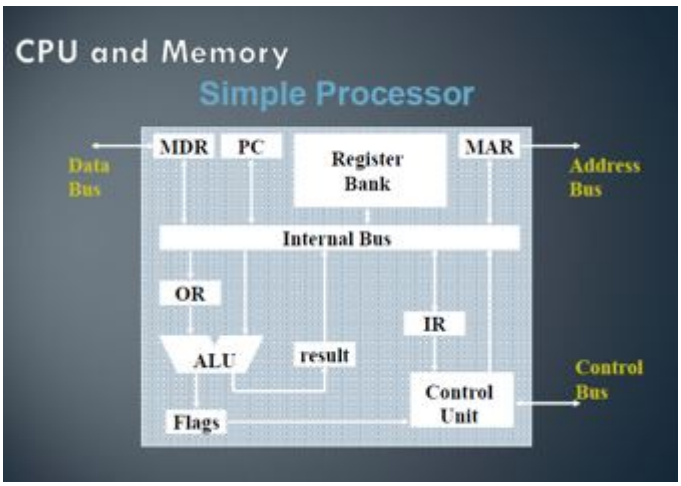
(A A + A B) V B C + C C V A C D

(A B) V (B C) V (A C D)

Q2. Explain how the essential registers in a CPU process data from the program counter to the memory data registrar? [5 Marks]

ANSWER Q2

- Program Counter (**PC**) holds the address of the next instruction to be executed.
- Instruction Register (**IR**) holds the instruction currently being executed.
- Memory Address Register (**MAR**) holds the address of a memory location.
- Memory Data Register (**MDR**) holds the data value that is written to/read from memory.
- Flag Registers show the status of an operation.
- Data transfer within a CPU takes place via the internal buses.
- General Registers are available to hold temporary data and addresses.



Q3. Explain the **Fetch-Execute Cycle** process that the CPU uses in the execution of instructions?

[5 Marks]

ANSWER Q3

- When running a program, all instructions are stored in consecutive memory locations. CPU can execute only one instruction at a time. Each time the CPU must fetch an instruction from memory and store it into a CPU register first. The PC registers holds the address of the next instruction to be fetched from memory.

- Fetch - Execute Cycle
    - Fetch

- Contents of PC to MAR (*Address of memory location from which data is fetched*)
- Increment PC
- Read memory - place instruction in IR
- Decode instruction
- Fetch operand (if necessary)

- Execute
  - Perform instruction

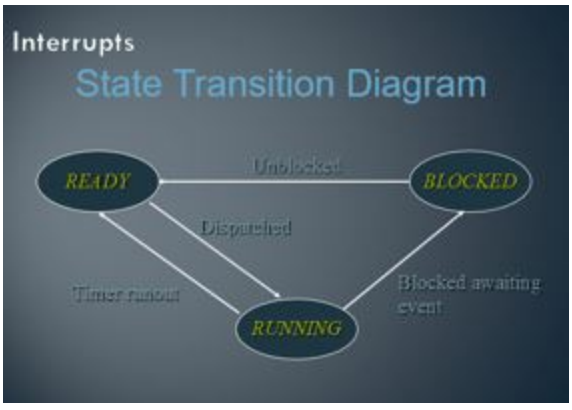
Write operand to memory (if necessary)

Q4. Define interrupts and with the aid of a diagram, explain how Multiprogramming System functions in a state transition diagram? [5 Marks]

ANSWER

Interrupts explains how the computer can do more than one thing at a time?

Multiprogramming System? Systems which allow many programs to be in a state of execution concurrently. A program in a state of execution is called a *process*. In a single processor machine only one process is *actually* being executed at a time (the *current process*).



STUDENT TO EXPLAIN THE THREE KEY POINT

- READY
- BLOCK
- RUNNING

- Quantums and the Dispatcher

- A real-time clock is used to signal the end of the period (quantum) for which a process is the current process.
- The quantum is determined by the dispatcher OS process.
- At the end of each quantum the dispatcher determines the next process to become the current process.

- When a timer interrupt occurs the dispatcher
  - Changes state of current process to ready.
  - Saves the process's *volatile environment* (CPU registers)
  - Determines the next process to make the current process
  - Loads the volatile environment of that process
  - Makes the state of that process *running*
- Busy waiting
  - Process contains code which continually test state of device
- Interrupts
  - Device sends signal to CPU to indicate that operation has been completed

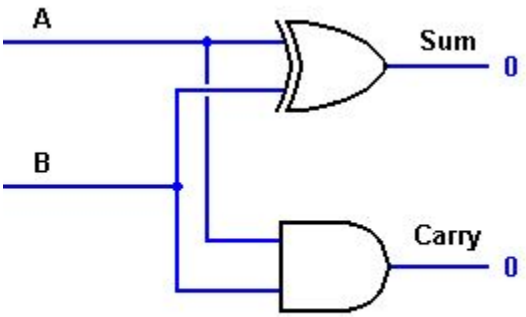
Q5. Explain the Half Adder and Full Adder and their logic tables for the Arithmetic Logic Unit us ing a diagram? [5 Marks]

ANSWER Q5

Half Adder

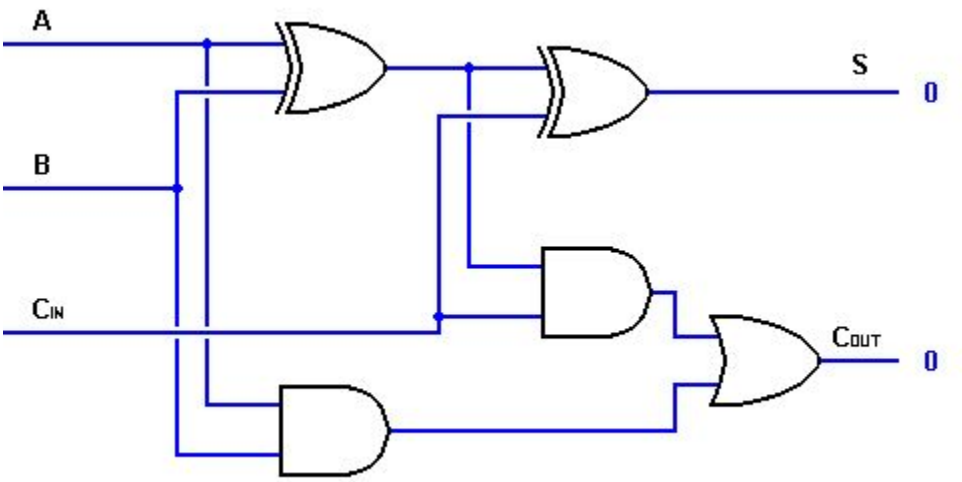
INPUTS		**OUTPUTS**	
A	**B**	**SUM**	**CARRY**
0	0	0	0
0	1	1	0
1	0	1	0

1 1 0 1



Full Adder

INPUTS		OUTPUTS		
A	**B**	**CIN**	**COUT**	**S**
0	0	0	0	0
0	0	1	0	1
0	1	0	0	1
0	1	1	1	0
1	0	0	0	1
1	0	1	1	0
1	1	0	1	0
1	1	1	1	1



Full Adder Circuit

Q6. Using the diagram, explain the main function of the operating system interfaces? [5 Marks]

ANSWER Q6

The OS is a set of processes permanently or transitively resident in memory to make the resources of the computer system available in a consistent, reliable and user-friendly manner.

Operating systems manage access to the resources of the computer system

The main function of the operating system is to serve as an interface between the computer hardware and the applications installed on the computer system.

Interfaces includes

- Operators
- Systems programmers
- Applications programmers
- Programs
- Hardware
- Administrative / personnel

- Users

Diagram