SLIATE

SRI LANKA INSTITUTE OF ADVANCED TECHNOLOGICAL EDUCATION

(Established in the Ministry of Higher Education, vide in Act No. 29 of 1995)

Higher National Diploma in Information Technology
Second Year, Second Semester Examination – 2015
IT 2401/IT3002/IT24 - Computer Architecture

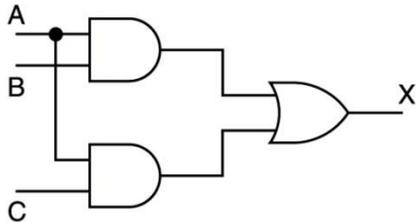|	
Instructions for Candidates:	No. of questions : 05
Answer only any 4 questions	No. of pages : 04
	Time : Two (02) hours.

Question 01

a)

i) What is the difference between combinational circuit and sequential circuit?

(02 marks)

ii) Which gates are called "universal gates" and why?

(02marks)

b) Consider the given logic circuit.

i) Draw the truth table for the circuit.

(04 marks)

ii) Give an expression for above circuit using both Boolean variables and minterms.

(03 marks)

iii) Simplify that expression using a K-map.

(03 marks)

c) Consider the given truth table.

A	B	X
0	0	0
0	1	1
1	0	1
1	1	0

i) Give the Boolean expression.

(04 marks)

    ii)   Which basic logic gate is present in the above table?

(02 marks)

    iii)   Implement a logic circuit for above table using minimum number of 2-input NAND gates. (Use Boolean algebra)

(05 marks)

[Total 25 marks]

Question 02

a) Give the functions/purpose of the following registers?
    i)   IR (Instruction Register):
    ii)   PC(Program Counter):
    iii)   MAR (Memory Address Register):
    iv)   MBR/MDR (Memory buffer Register/ Memory Data Register):

(04 marks)

b) What is meant by fetch and execute cycles in CPU operations?

(04 marks)

c) Explain 3 types of Pipeline Hazards and state the solutions to avoid Pipeline Hazards.

(3x3=09marks)

d) Consider a 7 phase pipelining architecture, Explain how many clock cycles are needed to complete the execution of 8 instructions. (Assume 1 cycles for 1 phase)

(03 marks)

e) Compare and contrast the RISC & CISC   .

(05 marks)

[Total 25 marks]

Question 03

a) List two features for each Static RAM (SRAM) and Dynamic RAM (DRAM)

(04 marks)

b) Define the following with respect to Disk Access Time for a Hard Disk
    i)   Seek time (Tavg seek)
    ii)   Rotational latency (Tavg rotation)
    iii)   Transfer time (Tavg transfer)
    iv)   Average time to access some target sector (Taccess)

(08 marks)

c) The features given below are of the hard disk.
- Rotational rate = 7,200 RPM
- Average seek time = 9 ms.
- 512 bytes/sector
- 400 sectors/track (on average)
- 20,000 tracks/surface
- 2 surfaces/platter
- 5 platters/disk

Use the above features to calculate the followings.

    i)   Rotational latency (Tavg rotation)
    ii)   Transfer time (Tavg transfer)
    iii)   Average time to access some target sector (Taccess)
    iv)   Capacity of the hard disk in GB

(08 marks)

d) What is cache misses?

(02 marks)

e) List three types of cache misses.

(03 marks)

[Total 25 marks]

Question 04

a) List three buses that make up the system bus?

(03 marks)

b) Give three reasons why an I/O device or peripheral device is not directly connected to the system bus?

(06 marks)

c) Explain three Major functions of an I/O module?

(06 marks)

d) " The Input / Output operations can be performed by three basic techniques "
    i)   Name two of the above techniques

(02 marks)

    ii)   Describe why direct memory access (DMA) is considered an efficient mechanism for performing I/O

(04 marks)

e) Write two(02) advantages of serial bus and two(02) disadvantages of parallel bus.

(04 marks)

[Total 25 marks]

Question 05

a) Explain the term of Deadlock what are the reasons to occur a Deadlock?

(04 marks)

b) What are the solutions used for deadlocks?

(04 marks)

c) Let CPI is the average cycles per instructions use to measure the CPU performance. Consider the data given below.
  - Clock rate=2.4GHz
  - CPI=4
  - Number of instructions in program=500
    Calculate the CPU execution time of this program?

(06 marks)

d) Briefly explain about the CPU scheduling in multiprogramming operating System?

(05 marks)

e) Suppose that the processes arrive in the order: P1, P2, P3, P4 following shortest job first (SJF) method. Calculate the average waiting time with following details.

(06 marks)

Process	Burst Time
P1	6
P2	8
P3	7
P4	3

[Total 25 marks]