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 – 2020

HNDIT 2401-Computer Architecture

Instructions for the candidates:

Answer Any four Questions

All Question carry equal marks

No. of question : 05

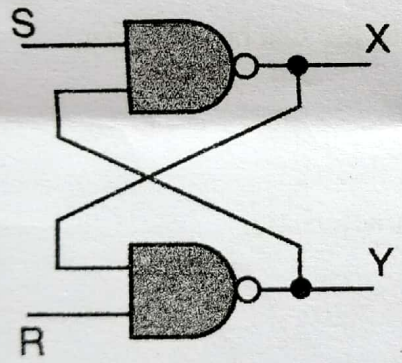
No of pages : 03

Time: Two (02) hours

Question 01

i. What is a Combinational circuit and give 02 examples. (04 marks)

ii. Identify the following circuit and briefly explain the functions of it. (04 marks)



iii. Write down the Boolean expression for following Boolean Algebra Laws. (05 marks)

a. Distributive Law

b. Associative Law

iv. Simplify the following Boolean expression with Algebra Law. (05 marks)

$$F = \overline{X + YZ}$$

v. Simplify the following function F using the Karnaugh Map. (07 marks)

$$F = \overline{A}BC + A\overline{B}C + AB\overline{C} + ABC$$

(Total 25 marks)

Question 02

i. Name 04 internal components of CPU. (04 marks)

ii. Briefly explain the functions of the following registers. (04 marks)

   a. Program counter

   b. Memory Buffer Register

iii. Briefly explain the main steps of Instruction Fetch cycle. (05 marks)

iv. Compare and contrast CISC and RISC. (05 marks)

v. Briefly explain the pipeline hazards. (07 marks)

(Total 25 marks)

Question 03

i. Draw a diagram to represent the memory hierarchy inside the computer. (04 marks)

ii. Write down the key features of static Ram (SRAM). (04 marks)

iii. Briefly explain the following memory operations. (05 marks)

   a. Memory Read Transaction

   b. Memory Write Transaction

iv. Briefly explain the following operation related to the Cache memory. (05 marks)

   a. Cache hits

   b. Cache misses

v. Suppose a hard disk drive has the following characteristic.

   Number of surfaces = 16

   Number of tracks per surface = 128

   Number of sectors per track = 256

   Number of bytes per sector = 512 bytes

   Average seek time = 5 millisecond

   Disk rotation = 6000 RPM

   a. Calculate the capacity of the hard disk. (03 marks)

   b. Calculate the average disk access time. (04 marks)

(Total 25 marks)

Question 04

i. Name 04 external buses used in the computers. (04 marks)

ii. Write down 04 major functions of the I/O module. (04 marks)

iii. Compare and contrast programmed I/O (Polling) and Interrupt Driven I/O techniques. (05 marks)

iv. Briefly explain the operations of Direct Memory Access (DMA). (05 marks)

v. Consider the following four process with the length of the CPU burst time and arrival time given in the milliseconds. Write down the answer using the preemptive Shortest Job First Algorithm.

Draw the Gantt chart and calculate the average waiting time. (07 marks)

Process	Arrival Time	Burst Time
P1	0	8
P2	1	4
P3	2	9

(Total 25 marks)

Question 05

i. Write down the 04 conditions of deadlock that appear in the system. (04 marks)

ii. Briefly explain the methods of handling deadlock. (04 marks)

iii. Briefly explain the following performance metrics. (05 marks)

a. Response Time

b. Throughput

iv. How clock cycles affected computer performance? (05 marks)

v. A program is running on a specific machine following parameters.

Total instructions count=10,000,000

Average CPI for the program = 2.5 cycles/instruction

Clock rate= 200 MHZ

Calculate the execution time of this program. (07 marks)

(Total 25 marks)