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
2nd Year, Second Semester Examination – 2017
HNDIT 2401 / IT 3002–Computer Architecture

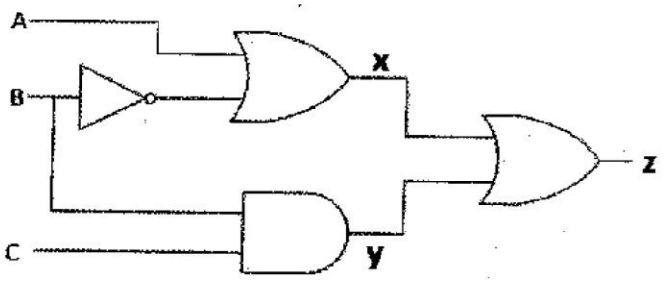
Instructions for Candidates:

Answer any 4 questions

No. of questions : 05
No. of pages : 04
Duration : 02 hours

Question 1.

(i) A, B, and C are inputs of following circuit.



a) Write the Boolean expressions of x, y and z (04 marks)

b) Draw the truth table for the above circuit outputs of x, y and z (04 marks)

(ii) a) Consider the following truth table

A	B	x
0	0	1
0	1	1
1	0	1
1	1	0

Which is the basic logic gate initiated in the above truth table? (02 marks)

b) Which type of circuit is output also consider as feedback (input)? (02 marks)

(iii) Simplify the following Boolean expressions by Boolean algebra. Mention suitable laws for each step.

a) F= A.(A+B) (02 marks)

b) F= AB + AB' + C (02 marks)

c) F= B + (AB)' (03 marks)

(iv) Simplify the following Boolean function F by K-Map (06 marks)

F= A'BC' + AB'C' + A'BC + A'B'C

[Total 25 marks]

Question 2.

(i) List 3 main functions of the CPU (Central Processing Unit) (03 marks)

(ii) Briefly explain 3 types of DMA (Direct Memory Access) configurations. (06 marks)

(iii) Briefly explain the following Registers

a) MAR(Memory Address Register) (02 marks)

b) IR (Instruction Register) (02 marks)

c) PC (Program Counter) (02 marks)

d) MBR (Memory Buffer Register) (02 marks)

(iv) In the design of computers, an instruction pipeline is a technique which is used to increase the instructions throughput of computer. Pipelining consists of 6 six stages.

a) State 2 stages of pipelining. (02 marks)

b) Explain 3 types of pipeline hazards. (06 marks)

[Total 25 marks]

Question 3.

(i) Capacity of a DVD-ROM is high and it is compared to a physically same size CD-ROM. What is the technology behind it? (03 marks)

(ii) Define the terms, "Seek time", "Rotational delay", and "Transfer rate" in hard disk operation. (06 marks)

(iii) Suppose a hard disk drive has the following characteristics

- 4 platters
- 1024 tracks per surface
- 128 sectors per track
- 512 bytes per sector
- Average seek time = 5 ms
- Disk rotational speed = 5000 rpm

a) What is the capacity of the hard disk? (02 marks)

b) Calculate the data transfer rate. (02 marks)

c) Calculate the average rotational latency. (02 marks)

d) Calculate the access time. (02 marks)

(iv) In computer architecture, the Memory hierarchy separates computer storage into a hierarchy which is based on response time.

a) What memory type has the fastest response as well as it is in top of the memory hierarchy? (02 marks)

b) Compare and contrast SRAM and DRAM. (06 marks)

[Total 25 marks]

Question 4.

(i) List 3 major functions of I/O (Input/output) module. (03 marks)

(ii) Describe the purpose of using "cache memory" and "virtual memory" (06 marks)

(iii) Compare and contrast CISC and RISC by using at least 4 features of them. (08 marks)

(iv) a) Explain the term of "multiprogramming". (02 marks)

b) Calculate the average waiting time for the processes given below by using Round Robin Algorithm. (06 marks)

Process	Arrival time (in seconds)	Service time (in seconds)
P1	0	5
P2	1	3
P3	2	8
P4	3	6

[Total 25 marks]

Question 5.

(i) CPU scheduling decisions may take place under the four circumstances. State 3 of them. (03 marks)

(ii) Consider the data given below regarding a CPU.

- clock cycle time= $1/(2.8 \times 10^9)$ sec/cycle
- Average cycles per instruction = 4
- Number of instructions in program = 400

What is the CPU execution time of this program? (06 marks)

(iii) There are many different criteria to check to considering **the best scheduling algorithm** in CPU scheduling. Briefly explain four of them. (08 marks)

(iv) a) What is the meaning of deadlock in operating system? (02 marks)

c) Explain 3 methods of handling deadlocks. (06 marks)

[Total 25 marks]