EASTERN UNIVERSITY, SRI LANKA

FACULTY OF SCIENCE

FIRST YEAR SECOND SEMESTER EXAMINATION IN SCIENCE - 2021/2022

(Aug. / Sept., 2024)

CS 1042 - COMPUTER SYSTEMS

Answer all Questions | Time Allowed: Two Hours

a) Briefly describe the 'Stored Program Concept' in the Von Neumann Machine. [20 Marks]

b) Distinguish between Virtual Memory and Physical Memory. [20 Marks]

c) Explain the operation of Random Access Memory (RAM). [20 Marks]

d) List five components attached with the power supply unit in a Personal Computer. [20 Marks]

e) Describe the main functions of the following components in a computer system:

i. Basic Input Output System (BIOS).
ii. Instruction Set Architecture (ISA).
iii. Program Counter (PC).
iv. Graphics Card.

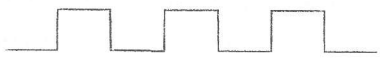
[20 Marks]

a) Briefly describe the functionality of Set-Reset (SR) flip-flop using NOR gates. [20 Marks]

b) Consider two signals given below which have same period and not the same pulse width. Illustrate at least three features of these signals in terms of signal representation factors.

a)

b)



[20 Marks]

c) Briefly explain a microarchitecture technique, Single Instruction Multiple Data (SIMD).

[20 Marks]

d) Draw the logical circuit representation of Full Adder and tabulate its function with the aid of truth table. [20 Mark

e) Instructions are executed in a sequential order while an application is performed in a compu

i. Briefly describe the term 'Cycles Per Instructions (CPI)'. [10 Mar

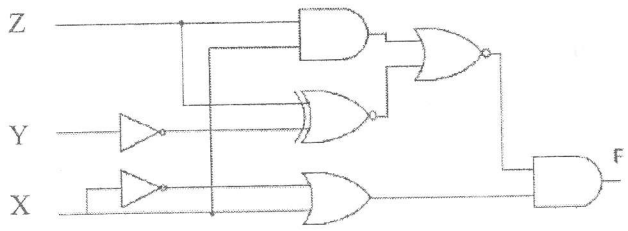
ii. Consider a program which has multiple instructions. If the program has,

50% of 'STORE' instructions (each takes 4 cycle)
15% of 'BRANCH' instructions (each takes 5 cycles)
15% of 'LOAD' instructions (each takes 5 cycles) and
20% of 'JUMP' instructions (each takes 4 cycles)

Then compute the CPI for this program. [10 Mar

Q3.

a) Show the behavior of the following circuit with a truth table.



[20 Ma

b) Convert the following Boolean expression into standard Sum of Product (SOP) form by sta step by step rules in the procedure.

LM'O + LO' + M'N'O' + LM'NO'

[30 Ma

c) A famous bank has a safe deposit locker facility. The bank provides this facility to keep valu things or documents. The access of that safety locker consists of four members: The author officer and three designated persons. The locker system is to be activated by a device obe these rules: each person of the panel has a button to push; the locker may open only i authorized officer and at least one person among three by pushing their buttons.

i. Specify the input and output variables and two states of each.
ii. Construct the truth table for the above design and write down the sum of min terms
iii. Simplify the above formula and draw the relevant circuital diagram.

[30 Mark

d) Minimise the following standard Sum of Product (SOP) for 5- variable expression using a Karnaugh map.

$$\mathbf{F(A, B, C, D, E) = \Sigma\, m\, (0, 5, 6, 8, 9, 10, 11, 16, 20, 24, 25, 26, 27)}$$

[20 Marks]

4. a) Computers C1 and C2 are assumed to have same instruction set.
C1 has a clock cycle of 50 MHz and C2 has a clock rate of 100 MHz
CPI for a given program for C1 and C2 are 2.8 and 3.2.
How many times does C2 faster than C1 for this program? What would the clock rate of C1 to have the same execution time? [20 Marks]

b) Briefly describe the pipelining stages of a microprocessor execution. [20 Marks]

c) Write down the description for the following typical interrupt signals in a microprocessor:

i. INTA
ii. RESET IN
iii. READY
iv. HLDA

[20 Marks]

d) Explain the system bus architecture in a computer system. [20 Marks]

e) Briefly describe the machine language instruction format by stating a suitable example.

[20 Marks]