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RESIT/SPECIAL

FOR THE WARD OF BACHELOR OF SCIENCE IN APPLIED COMPUTER SCIENCE

ACSC 102: INTRODUCTION TO DIGITAL LOGIC

STREAMS: B.Sc. (APPLIED COMP.SCI) Y1S1 TIME: 2 HOURS

DAY/DATE: MONDAY 01/02/2021	11.30 A.M. – 1.30 P.M.	
INSTRUCTION: Answer questionONE and any other TWO questions.		

QUESTION ONE (30 MARKS)

(a) Explain the impact of cache misses (both read and write misses) on the gene performance.	eral computer (3 marks)
(b) Perform the following number system conversion. 597.485 ₁₀ to Binary system.	(3 marks)
(c) Construct a truth table for the Boolean expression shown below.	(4 marks)
$x(\overline{yz} + x\overline{y})$	
(d) Briefly explain the fetch-execute cycle in instruction execution.	(4 marks)
(e) Explain the role of Program Counter and Accumulator during instruction ex	ecution. (4 marks)

(f) Draw the combinational circuit that directly implements the following Boolean function. (4 marks)

$$\mathbf{F}(x,y,z) = \mathbf{x}\mathbf{z} + (\,\overline{\mathbf{x}\mathbf{y}} + \overline{\mathbf{z}}\,)$$

(g) Simplify the Boolean function using Boolean identities. Show the Boolean identities used in each step. (4 marks)

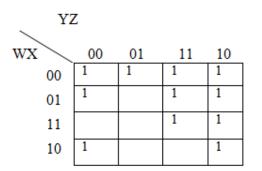
$$F(x, y, z) = \overline{x}\overline{y}\overline{z} + \overline{x}y\overline{z} + x\overline{y}\overline{z} + xy\overline{z}$$

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(h) Find the sum of 39₁₀ and -17₁₀ in binary using the two's complement arithmetic. Use 8 bits to represent the binary numbers. (4 marks)

QUESTION TWO (20 MARKS)

- (a) Explain the purpose of interrupts in processor performance. (3 marks)
- (b) Design a truth table for a three –input exclusive-**OR (XOR)** operation. Design its implementation using AND, OR and NOT gates. (9 marks)
- (c) Get the simplified version of the Boolean function represented in the Kmap shown below. Design a logic diagram for the simplified function.(8 marks)



QUESTION THREE(20 MARKS)

- (a) Explain what is cache coherency?
- (b) Create a Kmap and then simplify the following function.

 $F(w, x, y, z) = \overline{y}x + w\overline{y} + \overline{w}xy + \overline{w}\overline{x}y\overline{z} + w\overline{x}y\overline{z}$

(c) A three-input digital circuit gives a TRUE output when a majority (i.e. 2 or more) of the inputs is TRUE. Develop a truth table for the output and then draw the logic diagram for the circuit implementation using AND, OR and NOT gates. (10 marks)

(2 marks)

(8 marks)

QUESTION FOUR(20 MARKS)

- (a) Show that $(X + Y)(X + \overline{Y})(\overline{X} + Z) = XZ$ using Boolean identities. (7 marks)
- (b) Describe the four major internal structural components of a computer system. Use a well labeled diagram to illustrate their interconnection. (7 marks)
- (c) Describe the following cache write policies. (6 marks)
 - (i) write-through
 - (ii) Write-back

QUESTION FIVE(20 MARKS)

- (a) Discuss three types of memory access techniques used in main memory and secondary memory devices. (6 marks)
- (b) Discuss the flow of program execution in the event of a raised interrupt when interrupts are enabled. Use an appropriate diagrams to illustrate your answer. (8 marks)
- (c) Perform the following number conversions:

i)	243.25 ₁₀ to base 4	(3 marks)
ii)	8FEA2 ₁₆ to binary	(3 marks)
