END-SEMESTER EXAMINATION, May-2024
Computer Organization and Architecture (EET2211)

Programme: B.Tech(CSE/CSIT) **Semester: 4th**
Full Marks: 60 **Time: 3 Hours**

Subject/Course Learning Outcome	*Taxonomy Level	Ques. Nos.	Marks
Able to explain the concepts that underline the modern Computer evolution, function, and organization.	L2	1,6, 7(a),7(b)	16
Able to identify the appropriate organization of a computer for achieving the best performance.	L3	2	6
Able to analyze and demonstrate the computer function and interconnection.	L2	3	6
Able to understand and analyze the computer memory system.	L2	4,5	12
Able to understand and analyze computer arithmetic via digital logic.	L3	7(c), 8,9(a),9(b)	12
Able to interpret low level processor operations using a series of computer instructions.	L3	9(c), 10	8

*Bloom's taxonomy levels: Remembering (L1), Understanding (L2), Application (L3), Analysis (L4), Evaluation (L5), Creation (L6)

Answer all questions. Each question carries equal mark.

1. (a) Differentiate between CISC and RISC architecture. 2

(b) Briefly explain the basic functions of a computer. 2

(c) Explain the four generations of deployment in IoT? 2

2. (a) Explain each variable that is related to Little's law. 2

A doctor in a hospital observes that on average 6 patients per hour arrive and there are typically 3 patients in the hospital. What is the average length of time each patient spends in the hospital?

(b) Describe any of the four techniques to increase the microprocessor speed. 2

(c) Compute the geometric mean for each system using X and Y as the reference machine, which shows the execution time in sec. 2

Benchmark	Processor		
	X	Y	Z
1	20	10	40
2	40	80	20

Argue the result obtained based on the performance.

3. (a) Describe the three key concepts of the von Neumann architecture. 2

(b) Discuss the top-level view of computer components with a suitable block diagram. 2

(c) Consider a hypothetical 32-bit microprocessor having 32-bit instructions composed of two fields: the first byte contains the opcode and the remainder the immediate operand or an operand address. 2

i) What is the maximum directly addressable memory capacity (in bytes)?

ii) How many bits are needed for the program counter and the instruction register?

4. (a) Discuss the general relationship among access time, memory cost and capacity in the memory hierarchy of the computer system. 2

(b) Explain the error correction process in the memory system using a suitable. 2

(c) An 8-way set associative cache of size 64 KB is used in a system with 32-bit address. The address is sub-divided into TAG, INDEX, and BLOCK OFFSET. How many numbers of bits in the TAG field? 2

5. (a) How is the syndrome for the Hamming code interpreted? 2

(b) Define and compare the RAID 0, and RAID 1 levels with suitable diagrams. 2

(c) Suppose an 8-bit data word stored in memory is 11000010. Using the Hamming algorithm, determine what check bits would be stored in memory with the data word. What are the three broad classifications of external, or peripheral, devices? 2

6. (a) Discuss the structure of an I/O module with suitable block diagram. 2

(b) Explain the steps involved in simple interrupt processing. Suppose that the 8255A is configured as follows: port A as output, port B as output, and all the bits of port C as input. Show the bits of the control register to define this configuration. 2

(c) When a number of device interrupt occur, how does the processor determine which device issued the interrupt. Explain this determination of priories among 8 devices with suitable block diagram. 2

7. (a) List and briefly define the key services provided by an OS. 2

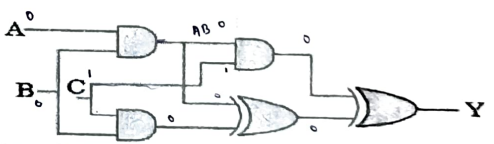
(b) Explain the memory layout for a resident monitor. 2

(c) Convert the decimal number 204.125 to their binary equivalent and hexadecimal equivalent. 2

8. (a) Assume numbers are represented in 8-bit twos complement representation. Show the calculation of the -6 + 13. 2

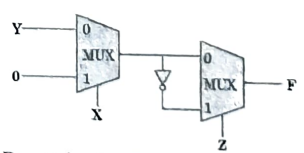
(b) Compute the product of 7*-5 with Booth's algorithm assuming each number represented in 4 bit long. 2

(c) The number 01000001010110100000000000000000 uses the IEEE 32-bit floating-point format. Determine its equivalent decimal value? 2

9. (a) 

2

Write the Bolen expression of Y in terms of A, B, and C. What is the output Y for A=B=0 and C=1?

(b) 

2

Determine the Boolean expression of F in term of X,Y and Z.

(c) Determine the contents of memory offset 6000H and 6001H after executing the following code. 2

```
MOV AL, 12H
MOV BL, 06H
MUL BL
ADD AX, 0015H
DIV BL
MOV [6000H], AX
HLT
```

10 (a) Discuss the addressing modes of ARM processor with suitable examples. 2

(b) Write an assembly language program using 8086 instruction set to add first 10 natural numbers and store the result in memory offset 5000H. 2

(c) Determine the content of registers and memory location. 2

```
        LDR R0, =0x4532ABCD
        MOV R1, #0x40
        ADD R0, R1, R0
        STR R0, [R1]
MY_EXIT: B MY_EXIT
```

End of Questions