VIT
Vellore Institute of Technology
CHENNAI

Reg. Number.	

Continuous Assessment Test (CAT) – I - August 2024

Programme	:	B.Tech Electronics and Computer Engineering (BLC)	Semester	:	FALL 24-25
Course Code & Course Title	:	BCSE205L & Computer Architecture and Organization	Class Number	:	CH2024250101399 CH2024250101395
Faculty	:	Dr. Vaidehi Vijayakumar Dr. M.Vidhyalakshmi	Slot	:	F2+TF2
Duration	:	1.30 Hrs	Max. Mark	:	50

Q. No.	Sub-division	Question Text	Marks
1		The instructions and data are stored in specific memory locations as shown below Memory Address: 8000 — Mnemonic: Load R1, #09 8004 — Load R2, #03 8008 — Add R1,R2 800C — Store [8010], R1, (i) Describe how the Von Neumann architecture executes the above instructions and data with a neat labelled diagram. (6 marks) (ii) For each instruction in the sequence, identify and describe the contents of the Program Counter (PC), Memory Address Register (MAR), Memory Buffer Register (MBR), and Instruction Register (IR) at the initial stage and after the completion of each instruction. (4 marks)	10
2		In a CPU with a register file containing six registers named R1 to R6, you need to compute the difference between two numbers: one stored at memory location 1500 and another at location 1800, the result should be stored back at location 1500. i) Write a few lines of assembly code to perform this task using complex instruction set. (4 Marks) ii) Illustrate how the above instructions are made simpler with each instruction taking only one clock cycle. (3 Marks) iii) Draw a simplified architecture diagram of the processors that supports the above operation and discuss its merits and demerits in detail. (3 Marks)	10
3		A company manufactures two types of products, and an automated system needs to calculate the total production for the week. The number of units produced per day on two production lines is given as: 12 units (binary: 1100) and 9 units (binary: 1001) respectively. i) Use Booth's algorithm to multiply the number of units. Show the step-by-step process of the algorithm and explain how it arrives at the final product. (7 Marks)	10

		ii) Discuss how Booth's algorithm handles the multiplication, particularly when dealing with negative numbers, and explain the significance of the algorithm in modern computer systems. (3 Marks)	
4		Imagine you are designing a digital system for a calculator that needs to perform division operations on binary numbers. Your system must support Restoring Division Algorithm. i) Describe the step-by-step process of how the algorithm performs division. Explain how it handles the restoration of values during the division process. (6 Marks) ii) Design a high-level flowchart for the algorithm, indicating the main steps and decisions involved. (4 Marks)	10
5		A company is designing a digital device to compute the total energy consumption of two appliances based on their power ratings and usage times. The power rating (in watts) and usage time (in hours) for each appliance are stored in separate registers: Appliance 1: Power rating in register P1 and usage time in register T1 Appliance 2: Power rating in register P2 and usage time in register T2 The goal is to calculate the total energy consumption using the following formulas: Energy for Appliance 1: $E1=P1\times T1$ Energy for Appliance 2: $E2=P2\times T2$ Total Energy: $Total=E1+E2$ Devise assembly code for this calculation using 0-address, 1-address, 2-address and 3-address instruction formats. Explain each instruction and its role in achieving the result.	10

********All the best**********