16/12. AN

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Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 90479

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2022.

Fifth Semester

Electronics and Communication Engineering

EC 8552 — COMPUTER ARCHITECTURE AND ORGANIZATION

(Common to Electronics and Telecommunication Engineering)

(Regulations 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Which is known as first operational general purpose machine built of vaccume tubes in 1944?
2. What is the significance of given instruction, "LOAD 1000, R_1"?
3. Compute the result after adding two floating point numbers? The numbers are $1.1100 * 2^4$ and $1.1100*2^2$.
4. Mention the size of single extended and double extended IEEE standard floating point formats.
5. List out the basic components of a one-bus data-path.
6. Write three performance measures achieved by implementing pipelining.
7. Define cache hit ratio and catch miss ratio in terms of memory.
8. What do you mean by software I/O polling?
9. What is a cluster?
10. Highlight on hardware multithreading.

PART B — (5 × 13 = 65 marks)

11. (a) Briefly describe eight great ideas in computer architecture with suitable diagrams. (13)

Or

(b) Imagine there is two machines A and B. The below table provides the information about instruction category of individual machine. Find CPI, CPU time and MIPS for each machine and compare their performances. (13)

Instruction category	No. of instructions (in millions)	No. of cycles per instruction
Machine (A)		
ALU	8	1
Load and store	4	3
Branch	2	4
Others	4	3
Machine (B)		
ALU	10	1
Load and store	8	2
Branch	2	4
Others	4	3

12. (a) Using binary floating point multiplication, multiply the numbers given as 0.5_{10} and -0.4375_{10}. (13)

Or

(b) Using floating point multiplication methodology, multiply $1.110_{10} \times 10^{10} \times 9.200_{10} \times 10^{-5}$. (13)

13. (a) What are hazards? Briefly describe all types of pipelining hazards with suitable examples. (13)

Or

(b) What is pipelining? Using suitable diagram, show a pipelined data path and briefly describe each stage of data path. (13)

14. (a) What is virtual memory? Using suitable diagrams, describe how virtual address is mapped to physical address? (13)

Or

(b) What is interrupt driven I/O? Discuss on the occurrence of the hardware event when an IO device completes an IO operation? (13)

15. (a) What is symmetric multi-processor? Describe symmetric multiprocessor organization using suitable diagram. (13)

Or

(b) What are the principal approaches to multithreading? Briefly describe each of them. (13)

PART C — (1 × 15 = 15 marks)

16. (a) Let us assume a mathematical expression: $C = C + A * B$. Here C, A and B are all square matrices with 32 elements in each dimension. The array starting addresses are parameters, so they are in $a0, $a1 and $a2. Assume that the integer variables are in $s0, $s1 and $s2, respectively. Write the corresponding MIPS assembly code for the given body of the procedure?

```
Void mm (double c [ ] [ ], double a [ ] [ ], double b [ ] [ ])
{
    int i, j, k;
    for (i = 0; i ! = 32; i = i +1)
    for (j = 0; j ! = 32; j = j +1)
    for (k = 0; k ! = 32; k = k +1)
    c [i] [j] = c[i][j] + a[i][k] * b[k][j];
```

Or

(b) (i) What is the purpose of GPU?

Discuss on the following with reference to GPU.

(1) To determine a good GPU.

(2) GPU for gaming.

(ii) Write a code for resolving a problem in graphics processing unit.