

Time 1:30 hours

Max. Marks:25

Note: Answer all the questions. All Questions carries equal marks
Assume suitable missing data ,if any

Q 1) Define the following terms:

(1*5=5)

- a. I/O Ports
- b. Types of instructions
- c. Timing and control
- d. Cache Memory
- e. Auto increment and decrement mode

Q 2)

- a) A processor can support a maximum memory of 4GB where the memory is word addressable (a word=2 bytes). The size of the address bus of the processor is atleast how many bits? (2)
- b) Explain register organization and types of interrupts and exceptions. (3)

Q 3)

- a) The value of float type variable is represented using the single precision 32-bit floating point format of IEEE-754 standard that uses 1 bit for sign, 8 bits for biased exponent and 23 bits for mantissa. A float type variable X is assigned the decimal value of -14.2. The representation of X in hexadecimal notation is? (2.5)

b)

- c) The program below uses six temporary variables a, b, c, d, e, f.

```
a = 1
b = 10
c = 20
d = a+b
e = c+d
f = c+e
b = c+e
e = b+f
d = 5+e
return d+f
```

Assuming that all operations take their operands from registers, what is the minimum number of registers

Needed to execute this program without spilling?

(2.5)

P.T.O.

Q 4) What is direct mapping? What is disadvantage of direct mapping? Consider a machine with a byte addressable main memory of 2^{20} bytes, block size of 16 bytes and a direct mapped cache having 2^{12} cache lines. Let the addresses of two consecutive bytes in main memory be $(E201F)_{16}$ and $(E2020)_{16}$. What are the tag and cache line address (in hex) for main memory address $(E201F)_{16}$? (5)

Q 5) The frequency of different types of instruction executed by a machine is tabulated below

Addressing Modes	Frequency
Register	30
Immediate	20
Direct	22
Memory Indirect	17
Index	11

Assuming 2 clock cycle are consumed for an operand to be read from the memory, 1 clock cycle for index arithmetic computation and 0 clock cycle if operand available in register or within the instruction itself. The average operand fetch rate of the machine is? (5)