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1. Fill in the blanks

1. Intel's embedded processor "embeds" the ICH and MCH into the microprocessor.
2. One can fabricate microcontroller by incorporating input output and memory modules to microprocessor.
3. If the computational resources : super computer , wearable , main frame , desktop , server , IoT , work station are arranged in the ascending order of their computational power , then the order would be :
Super computers > Mainframe > Servers > Workstation >
Desktop > IoT > Wearable.
4. The hardware realization of multiplier in a microcontroller/microprocessor is a organizational issue.
5. Data bus is always bidirectional while the address bus is always unidirectional.
6. Major difference between the microcontroller and the microprocessor is : Microprocessor consists of only a central processing unit (CPU),
whereas Microcontroller contains a CPU, Memory, Input Output
all integrated into one chip.

7. In the Neumann architecture discussed in the class, the MBR handles a word of length 40 bits. Similarly IR 8 bits, IBR 20 bits, MAR 12 bits and finally PC 12 bits.
8. Output of IR is a control signal.
9. Issues or performance measures of whether a hardware multiplier implementation or software realization of multiplier algorithm in a microprocessor design are: Anticipated frequency of use of multiply instruction, Relative speed of two approaches cost and physical size (foot print).
10. (a) As we know $1024 = 2^{10}$.
Ans. Therefore, 10 bits are required to uniquely identify a memory word.
- (b) Size of memory = (1024×40) bits
Ans. = 40960 bits.

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6. (a) Instructions used are :

Ans.

	Opcode		
01	00000001	LOAD M(x)	Transfer M(x) to the accumulator.
05	00000101	ADD M(x)	Add M(x) to AC, put result in AC.
21	00100001	STOR M(x)	Transfer contents of AC to memory location M(x).

(b)	<u>Step</u>	<u>MAR</u>
	1	300
	2	940
	3	301
	4	941
	5	302
	6	941