**Computer Instruction**

* The basic computer has three instruction code format and each have 16-bits.
* The opcode contains 3-bit and remaining 13-bits meaning depends on the opcode encountered.
* If opcode contains 3-bit 111 then instruction format is register reference instruction if left most bit is 0 and is input-output instruction if left most bit is 1.
* If opcode contains other than 111 then it called memory reference instruction, which use 12-bits for address and one left most bit (I) for addressing mode.
* In memory reference instruction if I = 0 then called direct addressing mode and if I = 1 then called indirect addressing mode.
* A register reference instruction specifies an operation on or a test of the AC register. An operand from memory is not needed; therefore, other 12 bits are used to specify the operation or test to be execute.
* Similarly, an Input Output instruction does not need a reference to memory. The remaining 12-bits are used to specify the type of input-output operation or test performed.

15 14 12 11 0

|  |  |  |
| --- | --- | --- |
| I | Opcode(3-bit) | Address (12-bits) |

1. Memory Reference Instruction (Opcode = 000 through 110)

15 14 12 11 0

|  |  |  |
| --- | --- | --- |
| 0 | 111 | Register Operation (12-bits) |

1. Register Reference Instruction (Opcode = 111 and I = 0)

15 14 12 11 0

|  |  |  |
| --- | --- | --- |
| 1 | 111 | I/O Operation (12-bits) |

1. I/O Instruction (Opcode = 111 and I = 1)

**Fig: Basic computer instruction format**

* Only three bits of the instruction are used for the opcode.
* It restricts maximum 8 distinct operations.
* Since, register-reference and I/O instruction use the remaining 12-bits as part of the operation code.
* The total number of instruction can exceed eight.
* The total number of instructions chooses for the basic computer is equal to 25.
* Instruction use three capital letters word abbreviation.

