1.

M[Sp] ← Register Value

SP ← SP – 1

*a.*

*Register Value* is store at memory and we know memory takes in 2 cycles. Each PUSH takes 2 cycle and there is total PUSH of 3. Register Value­1, Register Value­2, and Register Value­result. Storing only takes 1 cycle and it waits for a cycle.

2(3) + 1 + 1 = 8 cycles

b.

SP = 7Dh = 125d = 8’b01111101

Since PUSHA instruction updates the register and is decremented by 1 (SP – 1), the value now will be – in decimal – 125 - 1 = 124d → 7C

The new value = 7C

2.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | Comments *OpCode* |
| 3C | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | LODA *0000* |
| 3D | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 5H *Content = 0101* |
| 3F | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | ADDA *02 = 0010* |
| 40 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 10 *Content = 1010* |
| 41 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | ADDO *03 = 0011* |
| 42 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | JMPP *06 = 0110* |
| 43 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1C *Content 0001 1100* |
| 44 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | STOA *01= 0001* |
| 45 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | F2 *1111 0010* |