**Experiment – 1**

**Problem statement**: Write an assembly language program to perform arithmetic operations.

**Assembly Language Code:**

* **Addition**

**MOV #10, R01** //Store value of 10 in register R01

**MOV #5, R02** //Store value of 05 in register R02

**ADD R02, R01** //Add the register R01 and R02 values and store the resultant value in register R01

**STB R01, 00** //Store the resultant value of R01 in memory location 00

**HLT** //Stop the simulator

* **Subtraction**

**MOV #20, R03** //Store value of 20 in register R03

**MOV #15, R04** //Store value of 15 in register r04

**SUB R04, R03** //Add the register R03 and R04 values and store the resultant value in register R03

**STB R03, 08** //Store the resultant value of R03 in memory location 08

**HLT** //Stop the simulator

* **Multiplication**

**MOV #6, R05** //Store value of 06 in register R05

**MOV #3, R06** //Store value of 03 in register R06

**MUL R06, R05** //Add the register R05 and R06 values and store the resultant value in register R05

**STB R05, 16** //Store the resultant value of R05 in memory location 16

**HLT** //Stop the simulator

* **Division**

**MOV #8, R07** //Store value of 08 in register R07

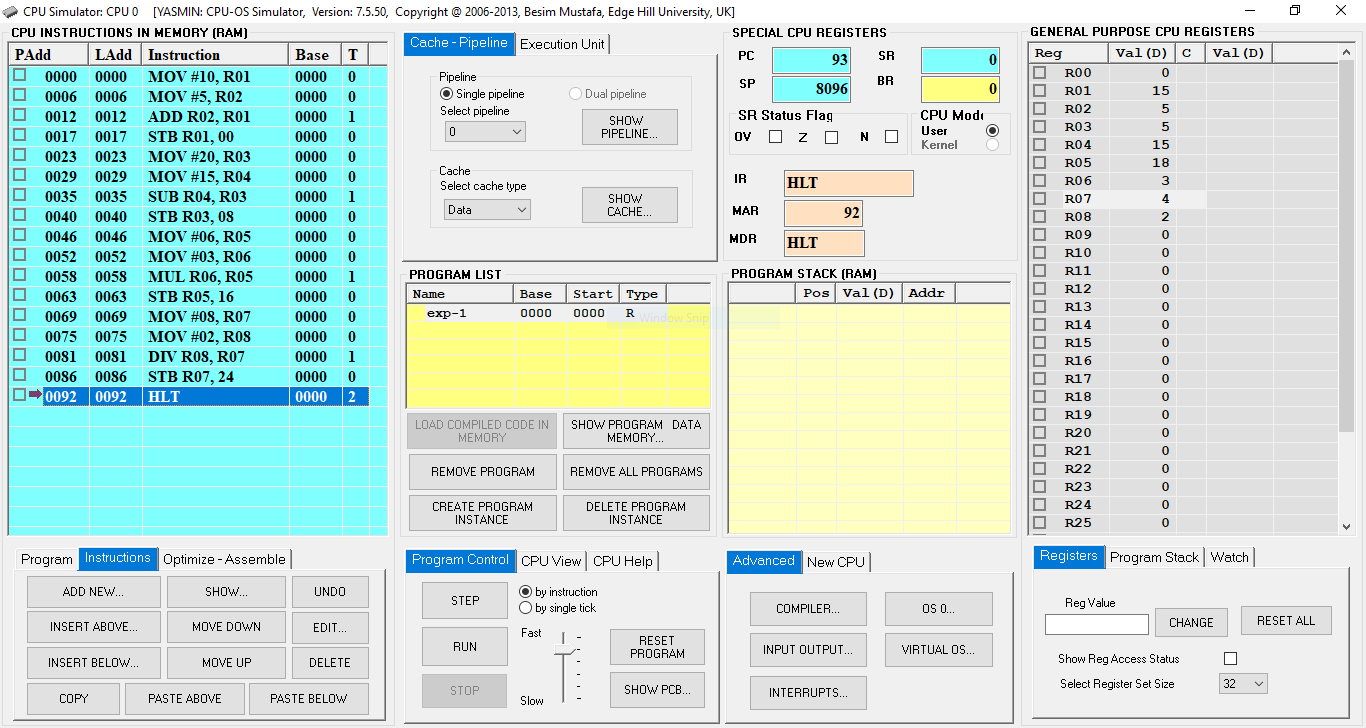
**MOV #2, R08** //Store value of 02 in register r08

**DIV R08, R07** //Add the register R07 and R08 values and store the resultant value in register R07

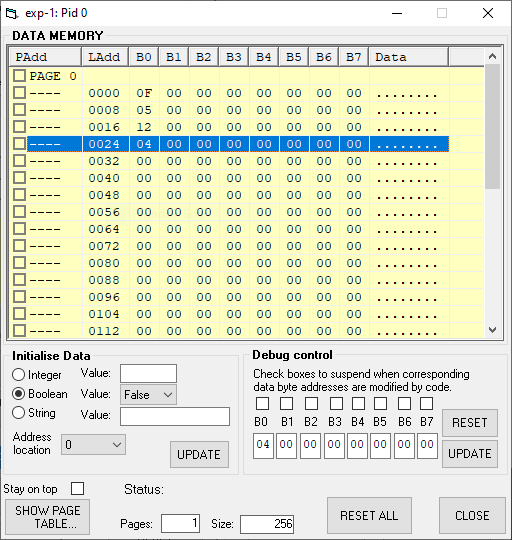
**STB R07, 24** //Store the resultant value of R07 in memory location 24

**HLT** //Stop the simulator

**Result:**



**Fig. 1**: CPU Simulator Window



**Fig. 2:** Data Memory Window

**Step 01**:

PC = 6

IR = MOV #10, R01

MAR = 0

MDR = MOV #10, R01

R01 = 10

**Step 02**:

PC = 12

IR = MOV #5, R02

MAR = 6

MDR = MOV #5, R02

R01 = 10

R02 = 5

**Step 03**:

PC = 17

IR = ADD R02, R01

MAR = 12

MDR = ADD R02, R01

R01 = 15

R02 = 5

**Step 04**:

PC = 23

IR = STB R01,00

MAR = 0

MDR = 15

R01 = 15

R02 = 5

00 = 0F

**Step 05**:

PC = 29

IR = MOV #20, R03

MAR = 23

MDR = MOV #20, R03

R01 = 15

R02 = 5

R03 = 20

00 = 0F

**Step 06**:

PC = 35

IR = MOV #15, R04

MAR = 29

MDR = MOV #15, R04

R01 = 15

R02 = 5

R03 = 20

R04 = 15

00 = 0F

**Step 07**:

PC = 40

IR = SUB R04, R03

MAR = 29

MDR = SUB R04, R03

R01 = 15

R02 = 5

R03 = 5

R04 = 15

00 = 0F

**Step 08**:

PC = 46

IR = STB R03, 08

MAR = 8

MDR = 5

R01 = 15

R02 = 5

R03 = 5

R04 = 15

00 = 0F

08 = 05

**Step 09**:

PC = 52

IR = MOV #06, R05

MAR = 46

MDR = MOV #06, R05

R01 = 15

R02 = 5

R03 = 5

R04 = 15

R05 = 6

00 = 0F

08 = 05

**Step 10**:

PC = 58

IR = MOV #03, R06

MAR = 52

MDR = MOV #03, R06

R01 = 15

R02 = 5

R03 = 5

R04 = 15

R05 = 6

R06 = 3

00 = 0F

08 = 05

**Step 11**:

PC = 63

IR = MUL R06, R05

MAR = 58

MDR = MUL R06, R05

R01 = 15

R02 = 5

R03 = 5

R04 = 15

R05 = 18

R06 = 3

00 = 0F

08 = 05

**Step 12**:

PC = 69

IR = STB R05, 16

MAR = 16

MDR = 18

R01 = 15

R02 = 5

R03 = 5

R04 = 15

R05 = 18

R06 = 3

00 = 0F

08 = 05

16 = 12

**Step 13**:

PC = 75

IR = MOV #08, R07

MAR =

MDR =

R05 =

R06 =

**Step 14**:

PC =

IR =

MAR =

MDR =

R05 =

R06 =

16 =

**Step 15**:

PC =

IR =

MAR =

MDR =

R05 =

R06 =

16 =

**Step 16**:

PC =

IR =

MAR =

MDR =

R07 =

**Step 17**:

PC =

IR =

MAR =

MDR =

R07 =

R08 =

**Step 18**:

PC =

IR =

MAR =

MDR =

R07 =

R08 =

**Step 19**:

PC =

IR =

MAR =

MDR =

R07 =

R08 =

24 =

**Step 20**:

PC =

IR =

MAR =

MDR =

R07 =

R08 =

24 =