DIGITAL ASSIGNMENT-1

ITE2001

COMPUTER ARCHITECTURE AND ORGANISATION

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Slot: - A1+TA1

BINARY MULTIPLICATION

CODE

```
from tabulate import tabulate
def fun(a,b):
    if len(b)<len(a):
        s="0"
        for i in range(len(a)-len(b)-1):
            s+="0"
        b=s+b
    elif len(b)>len(a):
        s="0"
        for i in range(len(b)-len(a)-1):
            s+="0"
        a=s+a
    e=0
    i=len(a)-1
    c=0
    while i>=0:
        s=(int(b[i])^int(a[i]))^c
        c=(int(b[i])&int(a[i]))|(c&(int(b[i])^int(a[i])))
        b=b[:i]+str(s)+b[i+1:]
        i-=1
    return c,b

print("19BIT0292")
mul=input("ENTER THE MULTIPLICAND: ")
```

```
mp=input("ENTER THE MULTIPLIER: ")
e=0
q=mp
tu="0"
for i in range(1,len(q)):
    tu+="0"
i=len(q)
sc=str(bin(i))[2:]
t=[["","0",tu,q,sc]]
a=tu
p=i
i-=1
while i>=0:
    sc=str(bin(i))[2:]
    i-=1
    e=0
    if q[p-1]=="1":
        e,b=fun(a,mul)
        t.append(["ADD",e,mul])
        t.append(["","",b])
        a=b
    q=a[len(a)-1]+q[:len(q)-1]
    a=str(e)+a[:len(a)-1]
    e=0
    t.append(["SHIFT",e,a,q,sc.zfill(len(str(bin(p))[2:]))])
print(tabulate(t,["OPERATION","E","A","Q","SC"]))
print("\nRESULT in BINARY= "+a+q)
print("\nRESULT in DECIMAL= "+str(int(a+q,2)))
```

SCREENSHOT OF CODE

D:\python code\intro.py

intro.py

```
1   from tabulate import tabulate
2   def fun(a,b):
3       if len(b)<len(a):
4           s="0"
5           for i in range(len(a)-len(b)-1):
6               s+="0"
7           b=s+b
8       elif len(b)>len(a):
9           s="0"
10          for i in range(len(b)-len(a)-1):
11              s+="0"
12          a=s+a
13      e=0
14      i=len(a)-1
15      c=0
16      while i>=0:
17          s=(int(b[i])^int(a[i]))^c
18          c=(int(b[i])&int(a[i]))|(c&(int(b[i])^int(a[i])))
19          b=b[:i]+str(s)+b[i+1:]
20          i-=1
21      return c,b
22
23  print("19BIT0292")
24  mul=input("ENTER THE MULTIPLICAND: ")
25  mp=input("ENTER THE MULTIPLIER: ")
26  e=0
27  q=mp
28  tu="0"
29  for i in range(1,len(q)):
30      tu+="0"
31  i=len(q)
32  sc=str(bin(i))[2:]
33  t=[["","0",tu,q,sc]]
```

```
34  a=tu
35  p=i
36  i-=1
37  while i>=0:
38      sc=str(bin(i))[2:]
39      i-=1
40      e=0
41      if q[p-1]=="1":
42          e,b=fun(a,mul)
43          t.append(["ADD",e,mul])
44          t.append(["","",b])
45          a=b
46      q=a[len(a)-1]+q[:len(q)-1]
47      a=str(e)+a[:len(a)-1]
48      e=0
49      t.append(["SHIFT",e,a,q,sc.zfill(len(str(bin(p))[2:]))])
50  print(tabulate(t,["OPERATION","E","A","Q","SC"]))
51  print("\nRESULT in BINARY= "+a+q)
52  print("\nRESULT in DECIMAL= "+str(int(a+q,2)))
```

OUTPUT-1

```
In [1]: runfile('D:/python code/intro.py', wdir='D:/python code')
19BIT0292

ENTER THE MULTIPLICAND: 101

ENTER THE MULTIPLIER: 110
OPERATION    E      A    Q    SC
-----------  ---  ---  ---  ----
             0    000  110    11
SHIFT        0    000  011    10
ADD          0    101
                  101
SHIFT        0    010  101    01
ADD          0    101
                  111
SHIFT        0    011  110    00

RESULT in BINARY= 011110

RESULT in DECIMAL= 30
```

OUTPUT-2

```
In [2]: runfile('D:/python code/intro.py', wdir='D:/python code')
19BIT0292

ENTER THE MULTIPLICAND: 11011

ENTER THE MULTIPLIER: 10111
OPERATION    E        A      Q    SC
----------  ---  -----  -----  ----
            0    00000  10111   101
ADD         0    11011
                 11011
SHIFT       0    01101  11011   100
ADD         1    11011
                 01000
SHIFT       0    10100  01101   011
ADD         1    11011
                 01111
SHIFT       0    10111  10110   010
SHIFT       0    01011  11011   001
ADD         1    11011
                 00110
SHIFT       0    10011  01101   000

RESULT in BINARY= 1001101101

RESULT in DECIMAL= 621
```

OUTPUT-3

```
19BIT0292

ENTER THE MULTIPLICAND: 111101

ENTER THE MULTIPLIER: 101011
OPERATION    E         A       Q    SC
-----------  ---   ------  ------  ----
             0    000000  101011   110
ADD          0    111101
                  111101
SHIFT        0    011110  110101   101
ADD          1    111101
                  011011
SHIFT        0    101101  111010   100
SHIFT        0    010110  111101   011
ADD          1    111101
                  010011
SHIFT        0    101001  111110   010
SHIFT        0    010100  111111   001
ADD          1    111101
                  010001
SHIFT        0    101000  111111   000

RESULT in BINARY= 101000111111

RESULT in DECIMAL= 2623
```

OUTPUT-4

```
In [5]: runfile('D:/python code/intro.py', wdir='D:/python code')
19BIT0292

ENTER THE MULTIPLICAND: 1110

ENTER THE MULTIPLIER: 1111101
OPERATION    E          A        Q    SC
----------  ---  -------  -------  ----
             0    0000000  1111101   111
ADD          0       1110
                  0001110
SHIFT        0    0000111  0111110   110
SHIFT        0    0000011  1011111   101
ADD          0       1110
                  0010001
SHIFT        0    0001000  1101111   100
ADD          0       1110
                  0010110
SHIFT        0    0001011  0110111   011
ADD          0       1110
                  0011001
SHIFT        0    0001100  1011011   010
ADD          0       1110
                  0011010
SHIFT        0    0001101  0101101   001
ADD          0       1110
                  0011011
SHIFT        0    0001101  1010110   000

RESULT in BINARY= 00011011010110

RESULT in DECIMAL= 1750
```

WHOLE SCREEN