Bit Manipulation Ops

Friday, 29 January 2021 9:42 AM

Right Shift

8 4 2 1

0 1 1 0

3 2 1 0

0 1 1 0 → 6

0 0 1 1 → 3

0 0 0 1 → 1

0 1 1 0 6 (Even)

0 0 1 1 3 (Odd)

Even

Bit Shifting

$2^4 = 16$ (0 … 15)

8 4 2 1

0 1 1 0

3 2 1 0

Left Shift

0 1 1 0 6

1 1 0 0 12

1 0 0 0 8

0 1 1 1 7

1 1 1 0 14

1 1 0 0 12

$2^8 = 256$ (0 … 255)

128 64 32 16 8 4 2 1

0 0 0 0 0 1 1 1 (Shift # 1)

0 0 0 0 1 1 1 0

Left Shift

OP-CODE | OPERAND

LSL | #n

Main Memory

20 | 8

21 | 64

22 |

23 |

LDD 20

LSL #3

STO 21

END.

Den. ACC: 8, 64

Bin. ACC: 00001000, 01000000

Right Shift

OP-CODE | OPERAND

LSR | #

20 5 : 3 12

32

00010000 (1)

00100000 (2)

01000000 (3)

Bit OPS.

AND — Clear — 1 → 0

OR — Set — 0 → 1

→ XOR — Toggle/flip — 0 → 1, 1 → 0

128 64 32 16 8 4 2 1

0 0 0 1 1 1 1 0

↓ → Bitwise

00011110

Bitmask — 00000001 OR

00011111

30 OR 1 = 31

1 1 1 1 0 0 1 1

1 1 1 0 1 1 1 0 AND

1 1 1 0 0 0 1 0

247 AND 238 = 226

1 0 0 1 1 1 0 0

0 0 1 0 0 0 1 0 OR

1 0 1 1 1 1 1 0

153 OR 34 = 196

+8 00001000

Invert 1 1 1 1 0 1 1 1

+1 0 0 0 0 0 0 0 1

−8 1 1 1 1 0 0 0

1's Complement

2's compliment

+5 00000101

−5 11111011

+8 00001000

−8 11111000

Main Mem.

30

51

52 +8

53 −8

54

LDD 52

XOR #255

INC

STO 53

END

7 – 10 Marks.

Den. ACC: 8, 247, 248

Bin. ACC: 00001000, 11110111, 11111000

00001000

11111111 XOR

11110111