Homework 5.

Q1: Solve: if it is two-address instructions. the op should be 32-12-12=8 bit

For there are 248 two-address instructions.

Thus for 00000000 ~ 11101111 has been used.

for 11110000 000000 000000 ~ 11111111 111111111111 can be used for single-address instructions.

That is 2^{16}. (if there are no zero-address instructions)

Q2: Solve: (1) when the jump instructions is acted, PC become 0222H+2 = 0224H.

so the relative offsee is 0246H - 0224H = 0022H that is 00100010

convert it to the 2's complement is 22H, that is 00100010

(2) the same as (1), PC become 0318H + 2 = 031AH.

so the relative offset is 0300H + -031AH = - 001AH. that is - 00011010

convert it to the 1's complement is E6H that is 11100110

Q3: (1) 8 general purpose register needs 3 bits to represent.

8 addressing modes also needs 3 bits to represent.

Thus the operation code has 16 - 3 - 3 = 10 bits

So if it is single-operand instruction, it at most has 2^{10} = 1024.

(2) if there using double-operand instruction

each operand should have 3 bits to represent register and 3 bits to represent addressing modes.

Thus the operation code has 16 - (3+3) - (3+3) = 4 bits

So if it is double-operand instruction, it at most has 2^4 = 16.

(3) if it is required for 14 double-operand instructions

So the 0000 ~ 1101 is used for the double-operand instructions

So the 1110 000000 ~ 1111 111111 can be used for single-operand instruction.

So it is 128.