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DUBAI INTERNATIONAL ACADEMIC CITY, DUBAI

SECOND SEMESTER 2015 - 2016

COURSE : COMPUTER PROGRAMMING (CS F111)

COMPONENT : Tutorial# 3 **SOLUTIONS** **DATE** : 11-FEB-2016

Q1. Using 16 bits, what is the range of signed integers that can be represented in each of the following cases

- **a)** Sign magnitude **$-(2^{15}-1)$ to $(2^{15}-1)$ i.e -32767 to +32767**
- **b)** 1's Complement **$-(2^{15}-1)$ to $(2^{15}-1)$ i.e -32767 to +32767**
- **c)** 2's Complement **$-(2^{15})$ to $(2^{15}-1)$ i.e -32768 to +32767**

Q2. Represent the following in 8 bits 2's Compliment

a) -20 Start with +20 in 8 bits 0001 0100 take 1's Complement 1110 1011 Take 2's Complement 1110 1011 +1 ------------ 1110 1100	**b)** 15 Start with +15 in 8 bits 0000 1111 For positive numbers the signed binary only will be the 1's C and 2's C 0000 1111
c) -38 Start with +38 in 8 bits 0010 0110 take 1's Complement 1101 1001 Take 2's Complement 1101 1001 +1 ------------ 1101 1010	

Q3. Find the decimal equivalent for the following 2's Compliment binary number

a) 1110 1100	**b)** 0110 1101

The MSB (**M**ost **S**ignificant **B**it or left most bit) is 1 therefore the decimal equivalent will be a –ve number. $(-2^7*1) + (2^6*1) + (2^5*1) + (2^4*0) + (2^3*1) + (2^2*1)+(2^1*0)+(2^0*1)$ = -20	The MSB (**M**ost **S**ignificant **B**it or left most bit) is 0 therefore the decimal equivalent will be a +ve number. $(2^7*0) + (2^6*1) + (2^5*1) + (2^4*0) + (2^3*1) + (2^2*1)+(2^1*0)+(2^0*1)$ = +109

c) 01 0011

The MSB (**M**ost **S**ignificant **B**it or left most bit) is 0 therefore the decimal equivalent will be a +ve number.

$(2^5*0) + (2^4*1) + (2^3*0) + (2^2*0)+(2^1*1)+(2^0*1)$

= +19

Q4. Perform the following arithmetic operation and check for the overflow

a) 23 – 15

The operation will be performed as

23+(-15)

The 2's C binary equivalent of 23 is 0001 0111

The 2's C binary equivalent of -15 is 1111 0001

Adding these two will result in **1**-0000 1000 (overflow is not there, but carry forward is there)

b) – 16 – 37

The operation will be performed as

(-16)+(-37)

The 2's C binary equivalent of -16 is 1111 0000

The 2’s C binary equivalent of -37 is 1101 1011

Adding these two will result in **1**-1100 1011 (overflow is not there, but carry forward is there)

Q5. Perform the following conversions

a) $(00110001100)_2$ = (**0614** $)_8$ = (**396** $)_{10}$
b) $(1A03)_{16}$ = (**0001 1010 0000 0011** $)_2$ = (**15003** $)_8$

Q6. Represent the following into IEEE floating point representation

a) -19.75

This is a –ve number so the sign bit will be 1

The binary equivalent to 19 is 10011

The binary equivalent to .75 is 11

So the representation will look like

-10011.11

After normalization it will become

$-1.001111 * 2^4$

After adding the biased exponent

$-1.001111 * 2^{4+127}$

The binary equivalent of exponent 131 is 10000011

So the IEEE representation will be

1 10000011 00111100000000000000000

b) 397.5

This is a +ve number so the sign bit will be 0

The binary equivalent to 397 is 110001101

The binary equivalent to .5 is 1

So the representation will look like

110001101.1

After normalization it will become

$1.100011011 * 2^8$

After adding the biased exponent

$1.100011011 * 2^{8+127}$

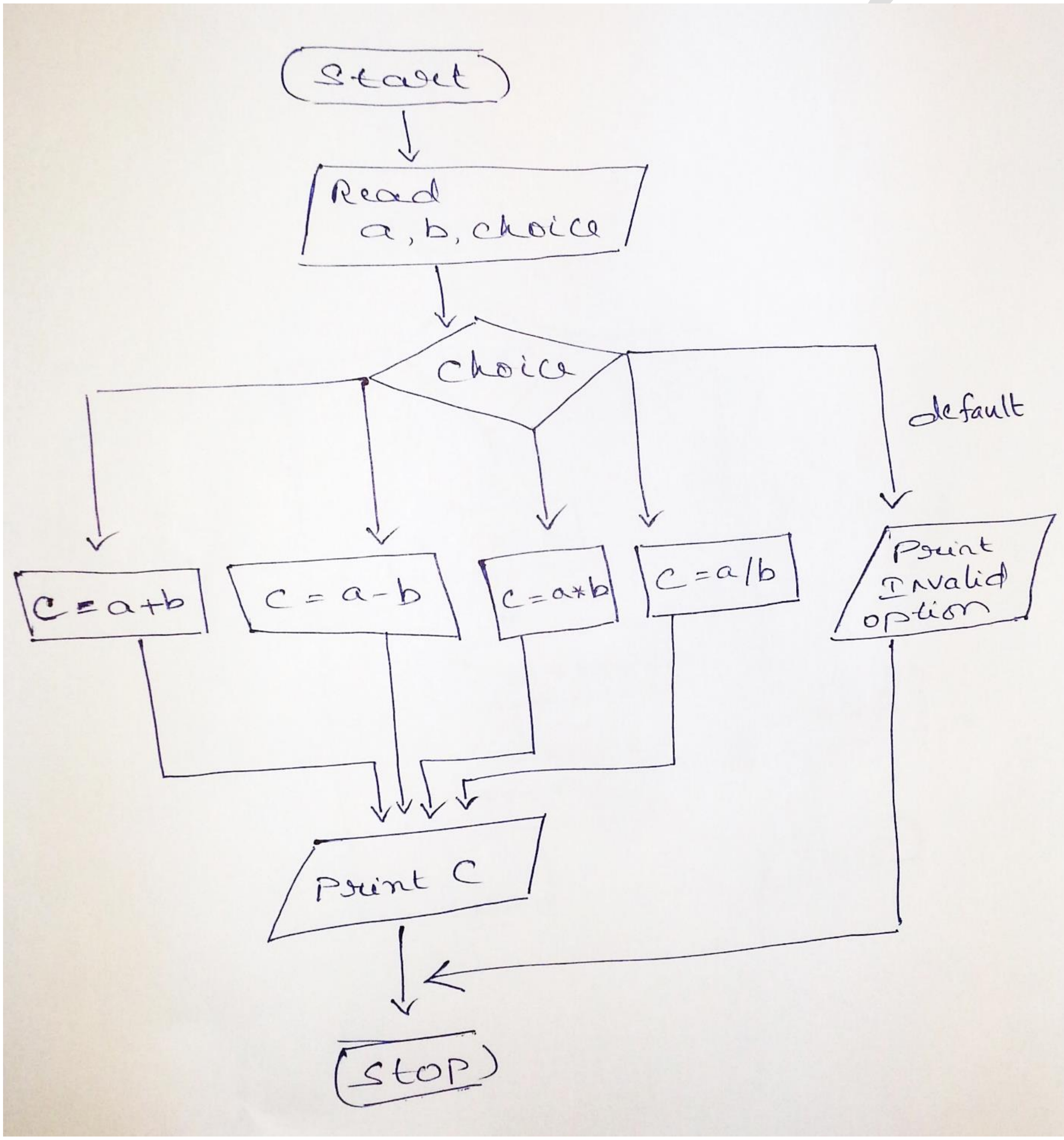
The binary equivalent of exponent 135 is 10000111

So the IEEE representation will be

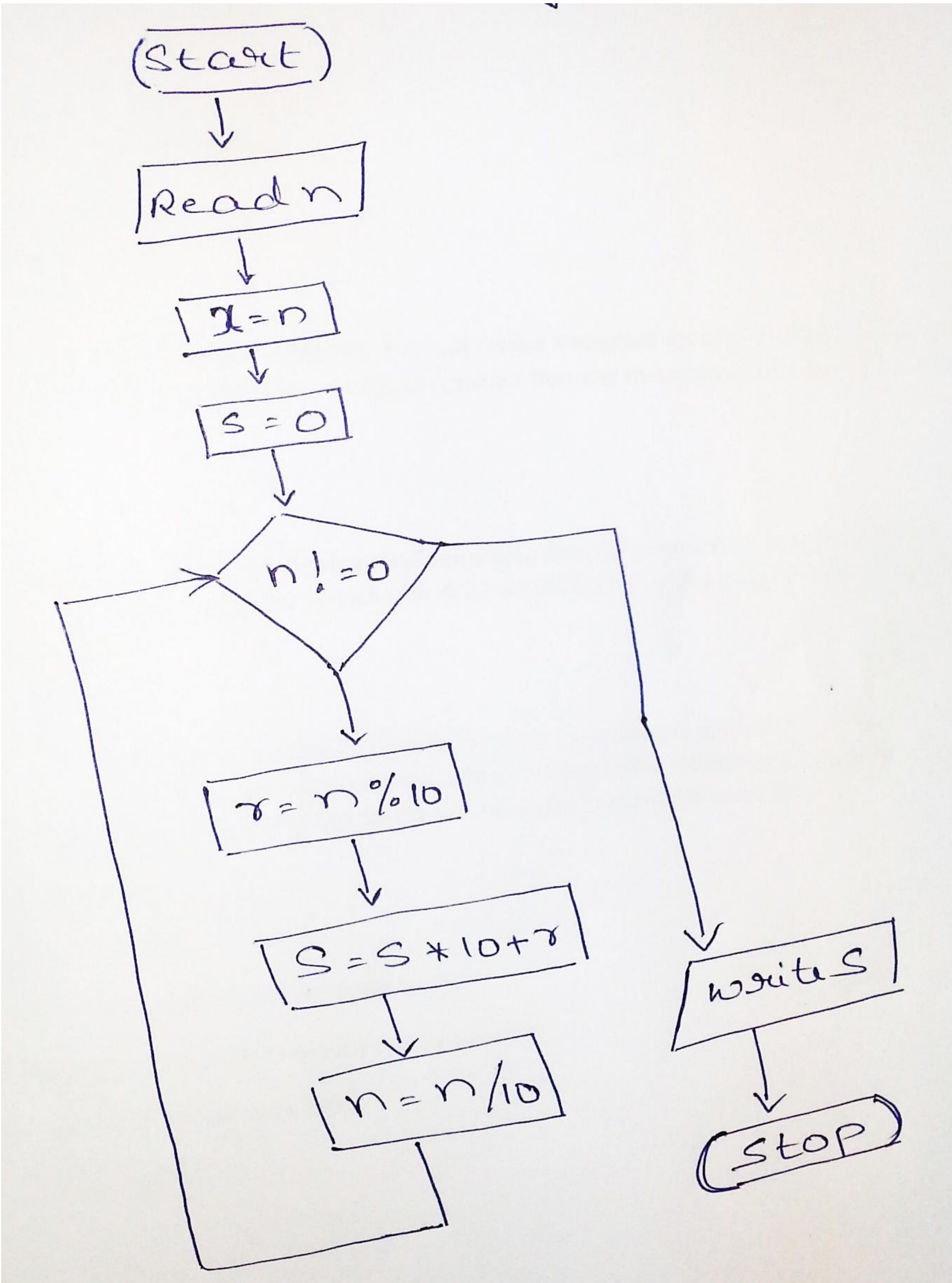
0 10000111 10001101100000000000000

Q7. Draw the flow chart for the following

a) Arithmetic operations (+, -, *, /)



b) Reverse a given number



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