Cairo University	Cairo University Institute Of Statistical Studies And Researches	
	Department: Computer Science	
	Academic Year: 2016-2017 **Semester:** First	
	Date: 20/12/2016 **Level:** Diploma	

Course Title:	Course code:	Time:	Exam marks:	# Exam. Sheets:
Introduction To Computer Science	CS500	90 Min	25	1 Page

Exam. Instructions : ANSWER ALL QUESTIONS

Question One: (6 Marks)

Convert the binary number $(1110110.1100011)_2$ to its equivalent numbers in the following systems:

(a) Octal

(b) Hexadecimal

(c) Decimal

(d) Base 4

Solution:

(a) $(\underline{001}\ \underline{110}\ \underline{110} . \underline{110}\ \underline{001}\ \underline{100})_2 = (166.614)_8$

(b) $(\underline{0111}\ \underline{0110} . \underline{1100}\ \underline{0110})_2 = (76.C6)_{16}$

(c) $(1110110.1100011)_2 = 1 * 2^6 + 1 * 2^5 + 1 * 2^4 + 1 * 2^4 + 0 * 2^3 + 1 * 2^2 + 1 * 2^1 + 0 * 2^0 + 1 * 2^{-1} + 1 * 2^{-2} + 0 * 2^{-3} + 0 * 2^{-4} + 0 * 2^{-5} + 1 * 2^{-6} + 1 * 2^{-7}$
$= (118.7734375)_{10}$

(d) $(118.7734375)_{10} = (1312.3012)_4$

$118 \div 4 = 29$	2	$0.7734375 * 4 = 3.09375$		3
$29 \div 4 = 7$	1	$0.09375 * 4 = 0.375$		0
$7 \div 4 = 1$	3	$0.375 * 4 = 1.5$		1
$1 \div 4 = 0$	1	$0.5 * 4 = 2.0$		2

Or because $4 = 2^2$, group each two binary bits into a single digit in base 4

$(\underline{01}\ \underline{11}\ \underline{01}\ \underline{10} . \underline{11}\ \underline{00}\ \underline{01}\ \underline{10})_2 = (1312.3012)_4$

Question Two: (5 Marks)

Assuming a floating-point binary pattern in **signed-2's complement** notation of length 12-bits with 1-bit for a sign, 4-bits for exponent and 7-bits for fraction. Find the following:

(a) Represent the binary value $(-.00001101001)_2$.

(b) Decode the bit pattern $(100101111111)_2$ to its equivalent decimal value.

Solution:

(a) $-.00001101001 = -.1101001 * 2^{-4}$

$Exponent\ (e) = (-4)_{10}$ ➡ $Exponent\ (e) = = (1100)_{-4\ in\ 2's\ complement}$

Best Wishes ☺

Dr./Ahmed Hamza

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Fraction (f) = $(.1101001)_2$

Sign (s) = $(1)_2$

S (1-bit)	*e (4-bit)*	*f (7-bit)*
1	*1100*	*1101001*

(b) Divide $(100101111111)_2$ into s(1-bit), e(4-bit) and f(7-bit)

s (1-bit)	*e (4-bit)*	*f (7-bit)*
1	*0010*	*1111111*

s = $(1)_2$ = - (negative)

f = $(.1111111)_2$

e = $(0010)_{2\text{'s complement}} = (+2)_{10}$

$- .1111111 * 2^{+2} = (- 11.11111) = - (2 + 1 + 2^{-1} + 2^{-2} + 2^{-3} + 2^{-4} + 2^{-5}) = (- 3.96875)_{10}$

Question Three: (4 Marks)

If the total memory capacity is 32KB and the memory cell capacity is 32-bit. Answer the following:

(a) What is the number of memory cells?

(b) What is the number of address lines?

Solution:

(a) Total memory capacity = number of memory cells * memory cell capacity

Number of memory cells = Total memory capacity / memory cell capacity

$= (32 * 1024) / (32 / 8)$

$= (32 * 1024) / 4$

$= (2^5 * 2^{10}) / 2^2$

$= 2^{15} / 2^2$

$= 2^{13}$

$=$ *8192 cell*

(b) Number of address lines = Log_2(Number of memory cells)

$= Log_2(8192)$

= 13 address lines

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Question Four: (10 Marks) *Mark the following statements as (√) or as (×)*

(a) Fonts and logos are examples of vector images. *(√)*

(b) ~~Durability~~ of storage device is its ability to access data on more than one type of media. *(×)* ***Versatility***

(c) 1 second = ~~1000~~ nanosecond. *(×)* ***10^9***

(d) CPU can read from and write to RAM. *(√)*

(e) MMC is more durable than DVD. *(√)*

(f) PROM is written and programmed once. *(√)*

(g) Virtual memory is type of ~~external~~ memory. *(×)* ***Internal***

(h) 6X BD drive has the same transfer rate speed of about ~~54~~X CD. *(×)* ***180***

(i) A disadvantage of ~~vector~~ images is that they cannot be rescaled easily to any arbitrary size. *(×)* ***Raster***

(j) EPS is a format of ~~video~~ file. *(×)* ***Vector Image***

(k) ~~SRAM~~ needed to be refreshed thousands of time per second to keep its data. *(×)* ***DRAM***

(l) Extended ASCII code uses ~~7 bits~~ to code ~~128~~ characters. *(×)* ***8-bits, 256***

(m) A ~~digital~~ parameter has continuous range of values. *(×)* ***analog***

(n) DRAM is usually synchronous. *(√)*

(o) In a gray-level raster image, each pixel can be represented by ~~three~~ bytes. *(×)* ***One***

(p) There are only ~~two~~ types of internal memory (ROM and RAM) inside a digital computer. *(×)* ***Seven***

(q) Storage capacity is measured in ~~Hertz (Hz).~~ *(×)* ***Byte (B)***

(r) Any change in computer configuration settings updates the ~~ROM~~ data. *(×)* ***CMOS***

(s) An advantage of raster images is their rich colors details. *(√)*

(t) VRAM is ~~nonvolatile~~ memory. *(×)* ***Volatile***

Best Wishes ☺

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