

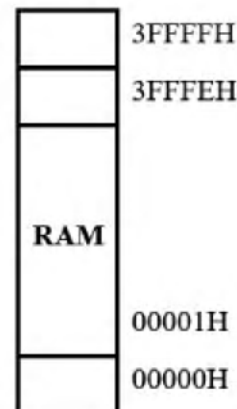
Taibah University		College of Computers science and Engineering
Computer Organization and Architecture COE 224		Date: 12 March 2019
Quiz: 01 Review		Total Marks: 30
Name:		ID:

Question 1:

[5 Marks]

- (a) Represent +127 as single precision floating-point number

$$\begin{array}{rcl}
 111\ 1111 & & 133 \\
 1.111111 \times 2^6 & \parallel & 10000101 \\
 \hline
 S & & \\
 0 \mid 1000\ 0101 & \parallel & 1111110 \text{ --- } 170
 \end{array}$$



- (b) A number that contains 3 one bits is said to have ODD parity
- (c) Assign the proper even parity bit to the following code: 101101011111
1 101101011111
- (d) For the shown figure of RAM, what is the size of the address bus to address the memory? 18 bit

Question 2:

[10 Marks]

Consider a hypothetical 32-bit microprocessor having 32-bit instructions composed of two fields: the first byte contains the opcode and the remainder the immediate operand or an operand address.

(a) What is the maximum directly addressable memory capacity (in bytes)? <u>31 24 23 0</u> <u>Op-Code Address</u> Address = 24-bit memory = $2^{24} = 16 \text{ Mbyte}$	(b) Discuss the impact on the system speed if the microprocessor bus has a 32-bit local address bus and a 16-bit local data bus, or - the whole address can be transferred at once - Require 2 cycle to fetch 32-bit instruction
(c) How many bits are needed for the program counter and the instruction register? - PC at least = 24-bit - IR may be 8-bit or 32-bit	How many instructions are there in the instruction set of this processor? op-code = 8-bit No. of instruction = $2^8 = 256$

Question 3:

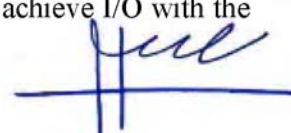
[5 Marks]

Consider a computer system that contains an I/O module controlling a simple keyboard/printer teletype. The following registers are contained in the processor and connected directly to the system bus:

INPR:	Input Register, 8 bits
OUTR:	Output Register, 8 bits
FGI:	Input Flag, 1 bit
FGO:	Output Flag, 1 bit
IEN:	Interrupt Enable, 1 bit

Keystroke input from the teletype and printer output to the teletype are controlled by the I/O module. The teletype is able to encode an alphanumeric symbol to an 8-bit word and decode an 8-bit word into an alphanumeric symbol.

- (a) Describe how the processor, using the first four registers listed in this problem, can achieve I/O with the teletype.



Input from the teletype is stored in INPR. The INPR will only accept data from the teletype when $FGI=0$, when data arrives, it is stored in INPR, and FGI is set to 1 — The CPU periodically check FGI . if $FGI=1$, The CPU Transfer contents of INPR to AC $\rightarrow FGI=0$

- (b) Describe how the function can be performed more efficiently by also employing IEN

The Teletype can issue an interrupt to the CPU whenever it is ready to accept or send data — The IEN register can be set by the CPU (programmer control)

Question 4:

[10 Marks]

- (a) A set-associative cache consists of 64 lines, or slots, divided into four-line sets. Main memory contains 4K blocks of 128 words each. Show the format of main memory addresses.

$K=4$ No. of set = $V = 2^d = 64/4 = 16$
 $d=4$ block size = $128 = 2^7 \Rightarrow w=7$
 memory size = $2^2 \times 2^7 = 2^9$
 Address bit = 19 $\Rightarrow$ Tag = 8

Tag	d	w
8	4	7

- (b) Consider the page stream of page requests. 2, 3, 2, 4, 6, 2, 5, 6, 1, 4, 6: Determine the **hit ratio** h for this stream using the **FIFO** replacement policy, assume the main memory can hold **three** pages and initially all of them are vacant

hit ratio = 2/11

2	3	2	4	6	2	5	6	1	4	6
2	2	2	2	6	6	6	6	1	1	1
	3		3	3	2	2	2	2	4	4
			4	4	4	5	5	5	5	6

- (c) Consider a **direct-mapped** cache configuration for a byte-addressable processor. The memory size is 256 bytes. The cache has two 16-byte blocks (for a total capacity of 32 bytes). how many bits are in the **tag**, **index**, and **offset**?

memory size = $2^8 \Rightarrow$ Address = 8-bit
 block size = $16 = 2^4 \Rightarrow w=4$
 No. of line = 2 $\Rightarrow l=1$

8		
Tag	l	w
3	1	4

- (d) Give some memory addresses in which the direct-mapped cache has lowest hit rate.

00010000
 00110000
 01010000

Free