

## M.Sc. CS / AI & CS Computer Systems Floating Point Numbers, Memory, Program Execution

**Question #1:** Find out the equivalent 32-bit Floating point representation for the following?

Decimal Fraction	Binary Fraction	Floating Point Representation (32 bit)
104.1875	1101000.0011	
-213.4375	-11010101.0111	
-0.15625	<u>-9</u> .00101	

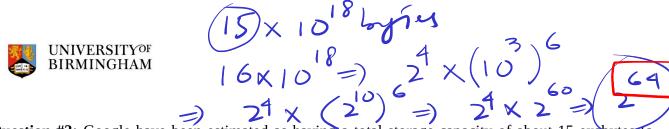
**Question #2:** An address space is a range of valid addresses in memory that are available for a program or process. That is, it is the memory that a program or process can access. The memory can be either physical or virtual and is used for executing instructions and storing data.

Considering the memory address sizes given in the table below, find out the maximum memory that could be installed in a given system. Also mention the minimum and maximum addresses in Hexadecimal.

			-
	1 Bit	= Binary Digit	
4	8 Bits	= 1 Byte	
	1024 Bytes	= 1 KB [Kilo Byte]	
	1024 KB	= 1 MB [Mega Byte]	
	1024 MB	= 1 GB [Giga Byte]	
	1024 GB	= 1 TB [Terra Byte]	
	1024 TB	= 1 PB [Peta Byte]	
	1024 PB	= 1 EB [Exa Byte]	
	1024 EB	= 1 ZB [Zetta Byte]	
	1024 ZB	= 1 YB [Yotta Byte]	

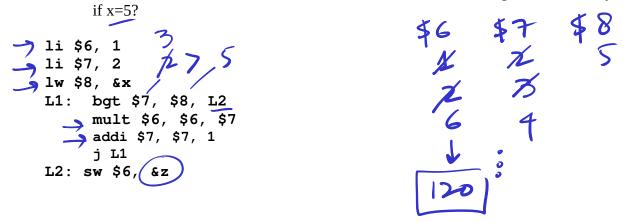
2 = 65536/1024

A	address Size	Max Supported Memory (Address Space)			Minimum Memory Address	Maximum Memory Address
	8 bits	256	6	yses .	D×00	OXFP
	16 bits	64	1	KB	DKDOOD	OXPAR
5	32 bits	4	4	B	000000000000000000000000000000000000000	OXFPRPPP
,	64 bits					



**Question #3:** Google have been estimated as having a total storage capacity of about 15 exabytes (a couple of years ago). We didn't get as far as the exabyte during our lectures, but it's 10 <sup>18</sup> bytes. If Google's storage were made into a single byte-addressed memory, how many bytes would the addresses have to be?

Question #4: What is the value stored in 'z' after the execution of the following MIPS assembly code,



**Question #5:** A processor is operating at 30MHz. Each instruction takes a minimum of 6 cycles to execute. The processor has a six stage pipeline. If a program starts execution at time 0, what is the theoretical maximum number of instructions that will have completed their execution at the end of 1 millisecond?

30 MH7 =) 30,000,000 gles/second

=) 30,000 gles/ms

FINS 9ns(1)+ (30,000 - 6)

=)  $1+29994 \Rightarrow 29,995 insize ms$