Q&A Session 1

Review & Preview

Q1) A central computer that holds collections of data and programs for many PCs, workstations and other computers is a

a)   Supercomputer

b)   Server

c)   Microcontroller

d)   Mainframe

Ans :

(b)

Q2)   A terminal that cannot do any processing by itself is a

a) Dependent terminal
b) Stand-alone terminal
c) Dumb terminal
d) Setup-box terminal

Ans :

(c)

Q3)   What is the total number of bits contained in the following?

a)   ASCII file containing the textual data - 1010010001110010

b)   binary file containing the data - 1010010001110010

Ans :

a) 16 * 8 = 128 bits = 16 bytes

b) 16 * 1 =   16 bits = 2 bytes

Q4) How many microprocessors did you carry to XJTLU today?

Ans :

Microprocessors can be found in

- calculator, mobile phone, iPhone, notebook,
  iPad, PDA, watch, portable music player,
  camera, etc.

Q5)   I have a block of 256 data bytes to be stored. Which of the following solution(s) is/are sufficient?

a) 8bit system with memory locations 0000 to 00FF

b) 16bit system with memory locations 0000 to 007F

c) 24bit system with memory locations 0000 to 0050

a) 8bit system with memory locations 0000 to 00FF

b) 16bit system with memory locations 0000 to 007F

c) 24bit system with memory locations 0000 to 0050

Ans :

(a) and (b)

(a)   F*16+F+1= 15*16+15+1 = 16*16 = 256

(b)   (7*16+F+1)*2= (7*16+16)*2=8*16*2=256

(c)   (5*16+1)*3=243

Q6)   Why does computing benchmarks on application speed show that the Intel Centrino 1.4Ghz CPU runs faster than an Intel P4 mobile 2Ghz CPU?

Ans :

- Clock speed is not always the deciding factor of computing speed in a system.
- Bottlenecks must be identified and improved, the system is as fast as its slowest component.
- E.g. a much larger cache memory allows less switching of data.
- E.g. faster system memory also reduces the system bottleneck
- E.g. increase system bus speed

Q7) What is the decimal equivalent of the following binary addition? Identify problems in this computation. Assume only 8 bits available to hold the results.

$$
\begin{array}{r}
1010\ 1101 \\
+\ \ 1100\ 0111 \\
\hline
?? \\
\hline
\end{array}
$$

Ans :

$$
\begin{array}{r}
1010\ 1101 \quad = 173 \\
+\ 1100\ 0111 \quad = 199 \\
\hline
0111\ 0100 \quad = 116 \\
\hline
\end{array}
$$

Why 173 + 199 = 116?

There is an **overflow.**

Carry bit (value 256) is ignored

Q8)   Why store data and communicate in digital format?

Ans :

Digital communication is used with the following benefits (reasons)

a) Analog representation is continuous, infinitely multi valued – leads to issues of precision.

b) Resilience to error.

c) Digital representation is discrete, only two values 0 and 1. Let two voltage levels 0V and 5V denote values 0 and 1. E.g. any signal levels between 0 ~ 2.5V will be read as value 0.

Q9) A PC has a microprocessor which processes 16 instructions per microsecond. Each instruction is 64 bits long. Its memory can retrieve or store data/instructions at a rate of 32 bits per microsecond.

Mention 3 options to upgrade system performance. Which option gives most improved performance?

Ans :

a) upgrade processor to one with twice the speed

b) upgrade memory with one twice the speed

c) double clock speed

(b) gives most improved performance.

Overcoming the bottleneck of a PC can improve the integrated performance.

Q10) Which component is used for temporary storage of data inside a CPU?

    a) Main memory

    b) ALU

    c) Registers

    d) Variables

Ans :

(c)

Q11) The main steps in a machine cycle are

    a) Compile, link, execute instructions.

    b) Interpret, translate to machine code, execute instructions.

    c) Instruction fetch, decode instruction, data fetch, execute and store.

    d) Data fetch, instruction fetch, decode instruction, execute and store.

Ans :

(c)

Q12) What controls how fast all the computer operations take place?

a) System buses
b) System Motherboard
c) System RAM
d) System Clock

Ans :

(d)

Exercise

(14 marks) Complete the following binary addition. What is the decimal equivalent of this addition? Identify problems in this computation. Assume the operands are prescribed in 2's complement format and only 7 bits are available. Suggest a solution in details for such a scenario.

```
   1001101
+  1010111
   ???????
```

-     1001101
- + 1010111
- <mark>01000100</mark>

- This binary addition involves the addition of two operands: 1001101 (-51) and 1010111 (-41). The result (01000100) from this binary addition gives 36 in decimal, which is not what we expect from (-51)+(-41) = (-92). The problem arises because of this addition runs out of 7-bit capacity for the sum. **(8 marks)**

- Solution: Use an 'overflow' flag mechanism to detect such an overflow, i.e. use the following simple rule to detect overflow: If both inputs to an addition have the same sign, and the output sign is different, overflow has occurred. **(6 marks)**