Higher Computer Systems – Exam Style Revision Questions

1. Describe how the number of cores affect the computer system performance **(2)**
   The more sets of instructions (1) that can be executed simultaneously on each core.(1)

2. Describe the concepts of the fetch and execute cycle **(4)**
   Processor activates the read line on the the control bus (1)
   An instruction is fetched from the memory location using the data bus and stored in the Instruction Register. (1)
   The instruction in the Instruction Register is then interepreted by the decoder and executed. (1)

3. Describe the environmental impact of an intelligent heating system **(2)**
   Any two from the following:
   - **Remote access to control heating when not at home**
   - **Use of geolocation can automatically turn heating off when no one is home**
   - **Takes account of external weather forecast and adjusts temperature accordingly**
   - **Real time temperature monitoring through mobile devices can reduce unnecessary gas/fuel use**
   - **Data can be analysed to determine how quickly a home heats and how slowly it loses heat meaning that the boiler can be used more efficiently**
   - **Multi room control systems prevent rooms being overheated when not in use**

4. Convert the following denary numbers to binary
   a. 0001 1111 **31** b. 1101 0110 **214** **(2)**

5. For only positive numbers what is the **range** of numbers that can be represented using 16 bits? **0 to 65535** **(2)**

6. Show the Twos Complement representation of the following Integers

   a. 51 **00110011** b. -120 **10001000** **(2)**

7. What is the range of **Integers** that can be represented using

   a. 8 bits twos complement? b. 16 bits twos complement **(2)**
   -128 to 127 **-32678 to 32677**

8. In floating point representation, what determines the
   a. **accuracy** of the number b. range of the number **(2)**
   Number of bits in the mantissa **Number of bits in the exponent**

9. State two ways of improving processor performance and explain how it improves processor performance. **(4)**

• increase the number of cores - multiple instructions simultaneously
• increase width of data bus - more bits transferred in a single operation
• add cache/increase cache - reduces number of accesses to slower main memory

10. Describe the benefits of intelligent car management systems on the environment. **(2)**

Any of the following describing the benefits to the environment:

- **autonomous driving is more fuel efficient due to system controlling accelerating/**
- **decelerating and detecting/anticipating braking**
- **intelligent route planning reduces driving time by monitoring external factors such as accidents/volume of traffic which reduces fuel consumption**
- **tracking parking reduces driving time searching for space and therefore fuel consumption**
- **engine management system optimises engine efficiency reducing fuel consumption**
- **intelligent road traffic management systems adjusting speed limits to optimise traffic flow reducing fuel consumption**

11. Write the binary number 110.001 using floating-point representation. There are 16 bits for the mantissa (including the sign bit) and 8 bits for the exponent. (3)

Sign Bit: 0
Remaining 15 bits of mantissa: 110 0010 0000 0000
Exponent: 00000011

12. Write the binary number −0.0101 using floating-point representation. There are 16 bits for the mantissa (including the sign bit) and 8 bits for the exponent.

Sign Bit: 1
Remaining 15 bits of mantissa: 101 0000 0000 0000
Exponent: 11111111

13. Describe how encryption is used to ensure the safe transmission of data. **(2)**

Public key encrypts the data
Private key decrypts the data

14. Explain how a digital signature works to ensure a document sent is secure. **(2)**

authenticates the sender
guarantees the integrity of the sent item/sent item has not been altered