PRIFYSGOL
BANGOR
UNIVERSITY

YSGOL CYFRIFIADUREG A PHEIRIANNEG ELECTRONIG
SCHOOL OF COMPUTER SCIENCE AND ELECTRONIC ENGINEERING

Arholiadau Diwedd Semester Un
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End of Semester One Examinations
JANUARY 2019

Time allowed: 2 hours

COMPUTER SCIENCE

Entrance Scholarship

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Answer all questions.

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Total marks 100

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COMPUTER SCIENCE: Entrance Scholarship

Answer **ALL** questions (Total marks 100)

1. Convert the following into decimal (base 10) numbers. You must show all calculations/working. [5]

   a) $1001\ 1001_2$
   b) Hexadecimal $0xBEEF$

2. What are the differences between the stages of execution when using compiled programming language and an interpreted programming language. You will need to refer to both source code and processor instructions in your answer. [5]

3. Explain how an internet browser downloads a complete web page (including images, scripts and styles) from the server. You should include details about protocols, requests, and URLs in your answer. [5]

4. What is the purpose of DNS in a network? How does it help? [5]

5. Construct the truth table for the XOR logical operation. [5]

6. You have a list of 50 numbers to operate on in a computer program. Name one way that all fifty could be stored in a single variable. What is one advantage of using that method? [5]

7. Describe how the Bubble Sort algorithm works. You may use diagrams to help explain your answer. [5]

8. Describe the purpose of a router within a Local Area Network. [5]

9. What does the the metric FLOp/sec (also written FLOPS) measure about a CPU? [5]

10. Explain what an FQDN (Fully Qualified Domain Name) is, and how they are used. [5]

11. The University wishes to store the follow information about students; [5]

    - Forename
    - Surname
    - Student ID Number
    - Course Code
    - Year of Study (1, 2, 3, or 4)
    - Date Enrolled
    - Welsh Speaking?

Two examples are shown in the table below:

Forename	Surname	Student ID	Code	Year	Enrolled	Welsh Speaker
Daffyd	Evans	S5000102414	G400	2	2013-09-23	Yes
John	Bloggs	T3211012911	I110	1	2015-10-01	No

With reference to your preferred high-level language suggest the data types needed to represent this information. Include which language you have chosen in your answer.

12. Describe a multi-core processor, how does it differ from a single-core processor? Why would multi-core processors be useful when dealing with multimedia applications? [5]

13. System CPUs (Control Processing Units) have an address, data, and control bus for dealing with the rest of the system. Describe what each of these three busses do. [5]

14. Using pseudo-code, describe how a program might go about validating a price read from a text file. You may assume that valid prices are in the range of 0.00 and 999.99. As this is currency, there may only be two decimal places. [5]

15. The recursive definition below defines part of the syntax for a new programming language. The definition uses BNF, and has the following entries. [5]

```
<digit> ::= 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9
<letter> ::= A | B | C | D | E | F
<integer> ::= <digit> | <digit> <integer>
<signed_integer> ::= + <integer> | -<integer>
<address> ::= <letter> <integer>
```

Use this definition to demonstrate that D341 is a valid address.

16. What is the difference between HTTP and HTTPS as used on the World Wide Web? [5]

17. Complete the following 4-bit binary logical calculation, include your working for each stage: [5]

NOT ((1101 OR 1001) XOR 1110)

18. Describe two (of the seven) principles governing the use and processing of Personal Data as provided for in the Data Protection Act (1984, 1998). [5]

19. Describe the Linked List data structure. Draw a suitable diagram to illustrate your answer. What is the benefit of this data structure? [5]

20. Computer programs are comprised of machine code instructions, what must happen before a CPU can execute each instruction? Assume that the program resides on the computer's hard disk. [5]