GCE A LEVEL

wjec cbac

A500U20-1

Z22-A500U20-1

eduqas
Part of WJEC

FRIDAY, 24 JUNE 2022 – MORNING

COMPUTER SCIENCE – A level component 2
Computer Architecture, Data, Communication and Applications

2 hours 45 minutes

ADDITIONAL MATERIALS

A WJEC pink 16-page answer booklet.

INSTRUCTIONS TO CANDIDATES

Answer **all** questions.

Write your answers in the separate answer booklet provided.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question; you are advised to divide your time accordingly.

The total number of marks available is 100.

You are reminded of the need for good English and orderly, clear presentation in your answers.

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Answer **all** questions.

1. Boolean and string are two primitive data types.

    Describe Boolean and fixed-length string data types and their storage requirements. [4]

2. In a certain computer, system denary values are represented as 8-bit signed integers in two's complement.

    (a) Using this system prove that $127_{10} - 126_{10} = 1_{10}$. [3]

    (b) (i) A similar computer system uses this 16-bit fixed-point representation:

Number	Fraction
8 bits before the decimal point	8 bits after the decimal point

    Convert the number 33.625_{10} into this fixed-point format. [2]

    (ii) The computer system is updated to use this 16-bit floating-point representation:

Mantissa	Exponent
12 bits in two's complement form. The binary point in the mantissa is immediately after the leftmost bit.	4 bits in two's complement form.

    Convert the number 33.625_{10} into this floating-point format. [2]

    (c) Compare, in terms of range and accuracy, fixed-point and floating-point representations. [3]

    (d) Arithmetic underflow may occur when carrying out floating-point operations. Describe, using an example, the cause of arithmetic underflow. [3]

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3. Describe **three** methods of file access. [6]

4. (a) AP Translation Limited (APT) provides professional language translation and interpretation services, specialising in legal and technical translations. The company uses relational databases to organise its business data.

Identify the benefits of relational database systems. [4]

(b) A typical APT job will involve translation from English to one of many other languages. Each job will be for one customer, although many of the jobs will be for repeat customers. APT may need to use several translators for each language they offer. A job is for a single language only. A translator can only translate in one language.

(i) Produce an entity relationship diagram for the job system described. [3]

(ii) Design a database structure in third normal form for the job system. [4]

5. A travel company sells holidays in France, Spain and Greece. The company uses a database system to manage its bookings.

(a) The following describes a database table:

Booking (bookingID, holidayID, bookingDate, holidayDate, customerID, cost)

Write an SQL command that will create this table using appropriate data types where all the data is required. [4]

(b) The Booking table is then populated with the following data:

Booking

bookingID	holidayID	bookingDate	holidayDate	customerID	cost
ID1002	F065	18/03/2022	18/07/2022	C1921	1546.00
ID1089	G094	18/03/2022	15/08/2022	C1954	2979.00
ID1101	F065	15/05/2022	25/07/2022	C1678	2164.00
ID1123	S198	17/02/2022	16/06/2022	C1989	3182.50

A Destination table has already been created in the database and contains this data:

Destination

holidayID	country	destinationName	resortName	hotelName
G094	Greece	Crete	Chania	Samaria Hotel
S198	Spain	Andalucía	Malaga	Casa Miraflores
F065	France	Provence	Avignon	Hotel d'Europe

(i) Write an SQL command to output the destinationName and hotelName of all the holidays in ascending order of country. [2]

(ii) Write an SQL command to output the bookingID and customerID of holidays taking place in July. [2]

(iii) A new customer, C2001, has made a booking for S198. The booking was made on 27/02/2022 with the holiday taking place on 23/06/2022. The cost of the holiday is £3125.

Write an SQL statement to add the record to the Booking table. [2]

6. (a) APT provides its staff translators with a Computer Assisted Translation tool (CAT) based on free-to-use open source software.

Describe **two** other advantages to APT of using open source software. [4]

(b) APT also provides its staff translators with a range of utility software, including file management and storage device management utilities.

Describe the role of **three** file management utilities that APT could use. [6]

7. An assembly language program processes a set of examination marks. A mark is compared with a pre-set pass mark and a '1' is output if a student has passed the examination and a '0' is output if the student has failed to achieve a pass.
These commands are available in the assembly language instruction set:

Command	Description
INP	Input a numeric value to the accumulator
OUT X	Output a numeric value X
STA X	Copy the contents of the accumulator to memory location X
LDA Y	Loads the numeric value in location Y to the accumulator
SUB Y	Subtract the numeric value in location Y from the accumulator, leaving the result in the accumulator
BRP	Branch if positive or zero to given label
BRA	Unconditional branch to given label
DAT	Indicates the location of stored data
HLT	Stop

Using the instruction set, write a program to compare the student mark entered with the pass mark that is also entered and produce the required output. [6]

8. Crawling, indexing and ranking are the three primary functions of an internet search engine.

   Describe the role of each of these functions when responding to a search engine request. [6]

9. A kernel is the central component of an operating system that provides the interface between software and hardware.

   (a) Describe **three** of the main roles performed by the kernel. [6]

   (b) Describe the benefits for APT of using an operating system and applications that support Unicode standardised character sets. [4]

10. APT has installed a computer network in its head office. The network supports both wired and wireless access.

    (a) Explain, giving an example, the importance of networking standards. [3]

    (b) APT is considering a BYOD (Bring Your Own Device) policy, which will allow its staff to use their own mobile devices when working on the office network.

        Describe the main risks involved to the company of adopting a BYOD policy. [6]

11. An engineering firm has decided to replace the 32-bit computer system it uses for Computer Aided Design (CAD) work with a new 64-bit system, with multi-core processors and increased memory.

    Explain the advantages the new system should provide for the engineering firm. [6]

12. Discuss the contingency planning that businesses should carry out to enable them to recover from computer system disasters.

    You should draw on your knowledge, skills and understanding from a number of areas across your computer science course when answering this question. [9]

END OF PAPER

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