H2 COMPUTING 9597
GCE A-LEVEL 2013 PAPER 2

1 A dental practice currently uses a computer system to store details of its patients, staff and appointments in separate files.

The practice manager and the receptionist have their own computers for accessing and updating the files.

The system produces a small number of reports.

An updated system is to be produced by a software company. The updated system will use a database. In the updated system the dentists will be given a hand-held device to use in their rooms for accessing and updating the patient records. The new system will also be capable of producing additional reports.

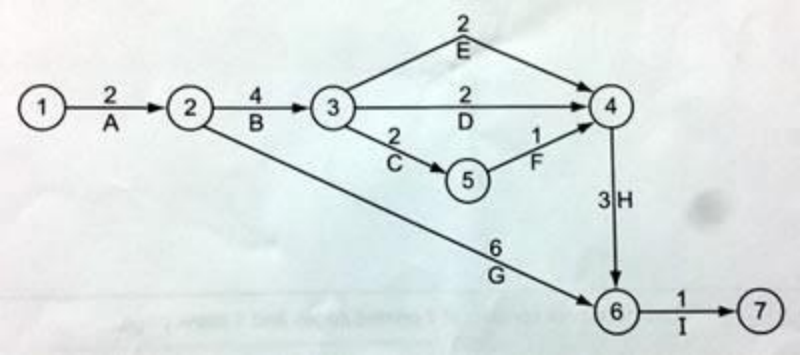
The software company has software engineers who have expert skills in specific areas of software development. A number of the engineers will be involved in the development of the updated system.

(a) Describe and justify three methods which can be used to determine what further reports are required from the updated computer system. [6]

(b) The work to update the system is partly managed by the following Program Evaluation and Review Technique (PERT) chart.

A - investigation
B - analysis
C - design of database
D - design of reports
E - design of screen displays for dentists
F - transfer of data from files into database
G - documentation produced
H - acceptance testing
I - hand over to customer

Time is measured in weeks.



(i) State the critical path. [1]

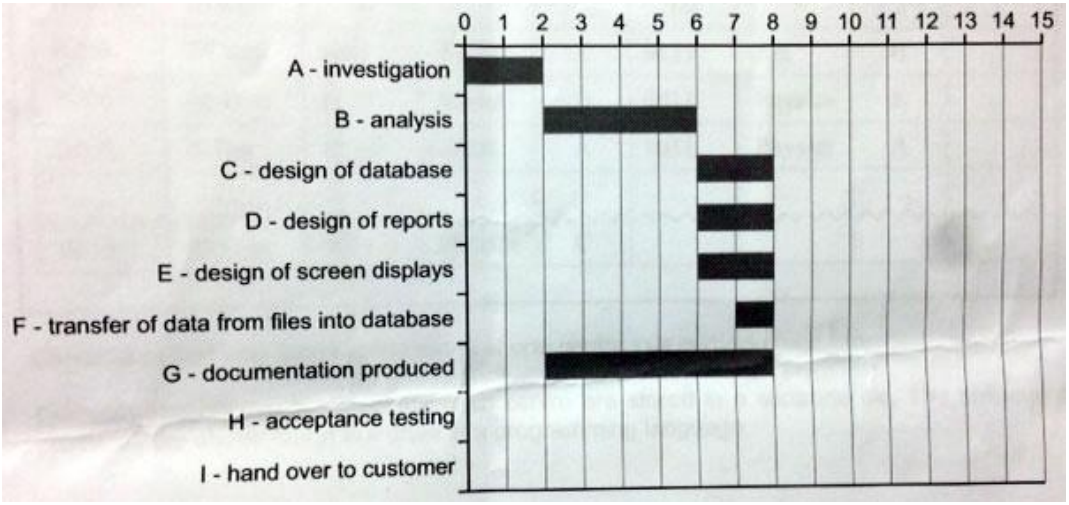
(ii) State the minimum time in which the updated system could be operational. [1]

(iii) For activity E state the

- earliest Start time
- earliest Finish time
- latest Start time
- latest Finish time

[4]

(c)



The Gantt chart above is based on the information in part **(b)**. The timing of two activities is missing and also the timing of one of the activities shown is incorrect.

Draw a sketch of the Gantt chart to show the correct version. [4]

(d) Explain how the Gantt chart can help with the work that the software engineers have to carry out. [2]

(e) A small team is put together to consider security aspects of the updated system.

(i) Identify **two** possible members of the team and justify your choice. [4]

The team have to produce a report to which they all make a contribution. The report is stored on a network. Each member of the team has access to allow them to add their contribution.

(ii) Give **two** examples of unethical behaviour by a team member. [2]

(f) Name and describe **two** types of documentation produced for this project. [6]

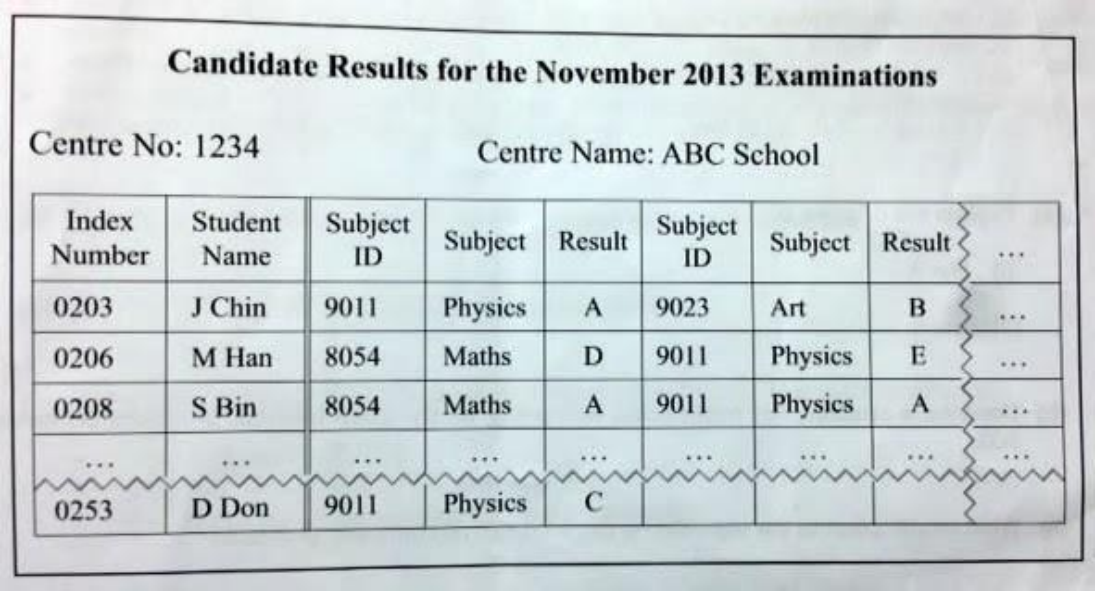
The hand-held devices the dentists use in their practice rooms will be networked. Both client-side scripting and server-side scripting will be used in the new software which is produced. An intranet with a web server will be created. Web browsers will be used on the hand-held devices.

(g) Describe three possible uses of the device. [6]

(h) For each scripting method, client-side scripting and server-side scripting, give an

appropriate example. Justify your response. [4]

2 Examination centres receive examination results for their candidates as a printed report. The report lists the candidates in order based on their Index Number. For each candidate their results occupy one row of the report. Each row displays the results for all subjects that the candidate sat in the examination.



Candidate Results for the November 2013 Examinations

Centre No: 1234 Centre Name: ABC School

Index Number	Student Name	Subject ID	Subject	Result	Subject ID	Subject	Result	...
0203	J Chin	9011	Physics	A	9023	Art	B	...
0206	M Han	8054	Maths	D	9011	Physics	E	...
0208	S Bin	8054	Maths	A	9011	Physics	A	...
...	...	...	...	...	...	...	...	...
0253	D Don	9011	Physics	C				

Candidates can only take examinations at one centre in a particular session.

Currently the candidate results for each centre are stored in a separate file. The software that produces the above report is written in a programming language.

(a) Describe, using an example, why this file has data redundancy. [2]

(b) An extra field is added to the file, but the report will not include this new field.

Describe the problem that will arise. [3]

A normalised database solution to this problem is designed, which has a number of tables.

(c) Draw an E-R diagram that shows these tables and the relationships between them. [5]

(d) When the data are stored in a database, privacy is of great concern.

Explain why. [2]

3 A hash table has an index range of 1 to 900. The following pseudocode describes an algorithm for searching the table using the hashing function Hash. It is assumed that the key is present in the table.

```
1. Index <- Hash(Key)
2. WHILE Table[Index, 1] <> Key
3.     Index <- Index + 1
4. ENDWHILE
5. Value <- Table[Index, 2]
```

(a) Explain the purpose of:

(i) line 3

(ii) line 5

[4]

(b) Describe a problem that might occur with a key which, when hashed, produces an index of 900. [2]

(c) What modification to the algorithm is required to overcome this problem? [3]

(d) Explain how a new item can be added to this hash table. [4]

4 A software development company currently hosts its own email server. The company is considering a replacement webmail service, using cloud computing.

(a) State two advantages of this change. [2]

(b) State one disadvantage of this change. [1]

The company is also considering other uses of the cloud. These include collaborative activities between employees of the company and also assistance in developing new software.

(c) Describe an example of how employees of the company may use the cloud to work collaboratively. [3]

(d) Describe how the cloud can be beneficial to the company when developing new software for a client. [4]

5 Bank customers are allowed to withdraw money from their accounts at an ATM. They cannot withdraw more than the current balance in their account. There is a daily limit on the amount that can be withdrawn. In some circumstances a charge is made for the transaction. The rules are:

- the transaction is rejected if the withdrawal amount requested is greater than the current balance

- the transaction is rejected if the withdrawal amount exceeds the daily limit
- if the current balance before the transaction is carried out is less than 50 dollars then any successful transaction incurs a fixed charge

(a) Create a decision table showing all the possible conditions and actions. [4]

(b) Simplify your decision table by removing redundancies. [4]

(c) Using your answer in (b) write a function using pseudocode. The function returns:

- -1 to indicate a rejection;
- 0 for a charge-free successful transaction;
- the charge for a chargeable successful transaction. [5]

(d) State two ways in which your answer in (c) demonstrates clarity of code. [2]

6 The ASCII code for the character 'Z', expressed as a denary integer, is 90.

(a) Express the denary integer 90 as:

(i) an eight-bit binary number

(ii) a hexadecimal number [2]

(b) Give two reasons why hexadecimal numbers are used in computing. [2]

(c) State the ASCII code for 'X' in denary. Explain your answer. [2]

(d) Explain why the Unicode encoding system has replaced ASCII. [2]

(e) Describe a method of storing strings of characters of variable length in a computer. [2]