ASQUITH GIRLS HIGH SCHOOL

TRIAL HIGHER SCHOOL CERTIFICATE 2001

SOFTWARE DESIGN AND DEVELOPMENT

Directions to Candidates

Reading time - 5 minutes
Working time – Two and a half(2.5) hours
Write you name in the space provided on this page.

Section I (20 marks)
Attempt ALL questions
Allow 35 minutes for this section
Write your name at the top of the page
Mark your answers on the Answer Sheet provided

Section II (45 marks)
Attempt Questions 21-23
Allow 1 hour and 20 minutes for this section
Use your own writing paper.
Write your name at the top of each page.
Start a new page for each question.

Section III - Options (20 marks)
Attempt either Q24 or Q25
Allow 35 minutes for this section
Use your own writing paper.
Write your name at the top of each page.

Section I
Twenty Multiple Choice Questions.
Select the most appropriate response and mark your answer on the attached Answer Sheet

Q1   Recently many accounting programs have been upgraded to handle the Goods and Services Tax. Bugs in the software and the difficulty of learning new software have caused many problems for the users. The social issue demonstrated by this example is one of.

a) dependence on software.
b) ethics.
c) plagiarism.
d) backward engineering.

Q2.   For the programmer, outsourcing has the advantage of.

a) requiring a very wide range of programming skills and experience.
b) possible lack of continuous work.
c) high short term income.
d) having to adjust rapidly to different business cultures and procedures.

Q3.   System flowcharts typically contain.

a) Symbols modeling repetition in a program.
b) Information on data types.
c) Less than and greater than symbols.
d) Symbols representing storage methods.

Q4.   A well- written library module will.

a) be both a black and a white box utility.
b) preferably use global variables.
c) have well documented parameter requirements.
d) have no internal methods.

Q5.   An algorithm uses nested for next loops to fill a two dimensional array with random numbers. It fills by columns starting at the top of each column and filling down. To change the algorithm so that it fills by row it is necessary to.

a) reverse the counters in the loop statement using "down to".
b) change the inner loop counter to count by columns and the outer to count by rows.
c) change the inner loop counter to count by rows and the outer to count by columns.
d) swap the indexes in the assignment statement to (row,row) instead of (col,col).

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Q6. Which of the following types of documentation make it easier to demonstrate to a user that the original specification have been met.

a) User acceptance tests.
b) Algorithms.
c) Machine code.
d) IPO charts.

Q7. A Gantt chart is one method of:

a) Recording the time taken for sections of a project
b) Avoiding the use of nested IF statements in programs.
c) Establishing a time frame for a project.
d) Developing sections of a project

Q8. Users of a new program were trained using an emulation running on a PC. When using the real program running on a mainframe over a network it was found too slow to respond to user's requests. This problem is likely to have been caused by.

a) Not considering the limitations of hardware and software.
b) Poor training methods.
c) Slow programming.
d) Virus infections.

Q9. Which of the following is an important factor keeping the cost of software high?

a) Low cost of production.
b) Low demand for the products.
c) Competition from overseas developers.
d) Plagiarism and piracy.

Q10. Prototyping as a development approach has been most enhanced by which of the following developments.

a) Object oriented languages with interactive screen object design.
b) Bottom up programming approaches.
c) Programming languages using text based development environments.
d) Scripting languages such as HTML.

Q11. A team of web site developers has been given a specification in the form of a storyboard showing a complex interacting web of pages. High quality graphics and scripting (programming) are required. Which of the following would be the best approach to development.

a) Allocate one team to do this project and give different projects to other programmers.
b) Let each team member work independently on the programming behind each page.
c) Let each team member work independently on a different page.
d) Identification of significant sub tasks and the allocation of these tasks to specialists on the team with management evaluation.

Q12. The inability to directly swap the contents of two memory locations causes the need.

a) for a temporary or intermediate variable in a sort routine.
b) for the programmer to perform a direct swap between registers in a search routine.
c) to increase the length of an array while sorting data.
d) for the allocation of large amounts of memory to a swap routine.

Q13. When working as a member of a team on a large programming project it is often necessary to.

a) keep separate rather than centralized documentation.
b) have team motivation meetings.
c) frequently change contract programmers.
d) get an experienced team member to check your work.

Q14. Which of the following will most probably have to be produced when testing software to implement an online booking system for a new startup airline company?

a) A single model of a customer record using dummy data.
b) A large volume of simulated customer booking information.
c) Batch processing benchmark test results.
d) A large sequential file of test data for on line use.

Q15. Users of a recently released application program report some annoying features such as having deeply nested dialogue boxes to make frequently performed choices.
Which of the following will be the most important tasks for the maintenance programmer correcting this situation?

a) Observing the users and changing the navigation through the interface.
b) Consultation with marketers to encourage improved sales.
c) Complete revision of the machine code.
d) Resizing the dialogue boxes and menus.

Q16. Which of the following problems would be best modeled using a three dimensional array as the primary data structure?

    a) A database of name address and telephone numbers for 100 employees.
    b) The location, described by row, aisle and shelf, of products in a warehouse.
    c) A list of employee ID numbers.
    d) One hundred digitized colour photographs.

Q17. What would be the most sensible management technique to use during a phased implementation?

    a) Fix any major errors in the program as soon as they are discovered during implementation.
    b) Avoid unnecessary costs by not employing any additional staff.
    c) Close observation of employees using system flowcharts.
    d) Careful management of the change process using Gantt charts to track tasks.

Q18. Now that the human genome has been completely mapped the TechnoGenetics company plans to produce a gene map for every living human being. This will be used to produce a public access database and to plan a medical campaign to wipe out all diseases. To do this they will finger print and take a small drop of blood from everyone on the planet. The task is most probably.

    a) Technically feasible and socially desirable.
    b) Technically very difficult but socially undesirable.
    c) Essential for the survival of the human race.
    d) Too expensive compared to the benefits.

Q19 When identifying processes in a requirements description it is helpful to look for.

    a) arrows indicating repetition.
    b) verbs describing actions.
    c) identifiers of variables.
    d) words such as display or print.

Q20. A programmer is working on a large program requiring fast machine code in the final product. She wants to avoid long compilation times and to develop code interactively, testing as she goes. She should choose to use.

    a) a bottom up approach.
    b) a single pass compiler on the complete code.
    c) an interpreted language.
    d) incremental compilation.

Section II.
Attempt ALL questions in this section.
Allow about 1 hour and 20 minutes for this section.

Question 21. (15 Marks)

a) Software companies are often under a great deal of pressure to be first to bring a software product to the consumer.
Identify and describe three examples of how this affects the quality of software produced under these conditions? (3 marks)

b) Describe two methods of overcoming these problems. (2 marks)

c) Large software companies have joined forces and jointly financed / sponsored programs aimed at reducing copyright infringements.
Describe two strategies/ programs these companies could use. (2 marks).

d) What characteristics of a system would lead the developers to choose an "direct cut over" method of implementation? (2 marks).

e) Lexical analysis and Syntactic analysis are two steps in the translation process.
Describe one of these processes and it's importance in the programming process.
(3 marks)

f) The development of software requires the creation of large amounts of documentation. Which documents are most likely to be used after the software has been in normal use for a long time? (1 mark)

g) Who would use them? (1 mark)

h) What would they be used for? (1 mark)

Question 22. (15 Marks)

You are the manager of a small software company with two programmers who only have experience in database applications. You are currently working on a large database application for another company.
You are approached with a request to produce the following software system.

Specifications:-
The proposed system must be able to accept normal human speech at any speed and in any language and immediately produce an accurate text version of the speech in English. The software must be completed in one month with a budget of $1000. The user interface must allow the user to monitor the entry of the speech, the progress of the translation and file production processes.
For this project to implemented the software would need to sample the speech sounds from a microphone at the rate of 1000 samples per second. The frequency patterns produced would be stored as 32 bit numbers and then compared to existing sample of speech. This is done in order to identify firstly the language (Spanish, English etc) then the part of the speech and to then identify the words being spoken. Once the words have been identified the sentence structure, grammar and meaning (semantics) would be worked out and exactly equivalent English language sentences constructed in ASCII code to be saved to file for word processing.

a) Identify one data structure or file structure, which may be needed to implement such a system and justify the choice of each structure (2 marks).).

b) Draw a labeled plan for the user interface. (4 marks)

c) Discuss the feasibility of accepting and building this project. (4 marks

d) Some projects require lots of communication and feedback between the user and the developers. Discuss if this is or is not an important feature of this project? (5 marks)

Question 23. (15 marks)

The members of a basketball team are lined up on the court. The coach selects the tallest player and moves her directly to the head of a second, new line. The coach repeats the process with the remaining members of the first line, each time moving the tallest player to the head of the new line. At no time do players swap position in either line. This process produces one line with the players sorted by height.

a) Identify this general type of sorting process (1 mark)

b) Write a pseudocode algorithm for this process using two arrays identified as Team_One and Team_Two. Assume the heights are already loaded into the Team One Array. (5 marks)

c) A ready-made module called "sort module" is available for use in the program. Two of its parameters are "Student data " and " Output list". What other parameter/s would be necessary if the module can produce a list of student's names and addresses (from the sorted data) where the student has a height greater than a height selected by the user? Show the parameter list. (2 marks).

d) A prototype can be used to assist the designer in discussing the interface design with the user. What aspects of the design should be discussed with the user and how will a prototype help this process? (4 marks).

e) Syntax description languages are subject to revision and improvement. Give an example of this from the improvements made to BNF resulting in the development of EBNF. (3 marks).

Section III - OPTIONS
- 20 Marks Total
Attempt either Question 24 or Question 25 - *NOT BOTH.*
Allow about 35 minutes for this section

EITHER .

Question 24.   (20 Marks)

a) Each of the 5 programming generations represented an increase in productivity for the programmer. Briefly describe the productivity of generation 2 and 4.

(2 Marks).

Since pigs are animals and some animals can fly it was decided that "Pigs may fly"
b) In which language paradigm of is this form of reasoning used to reach a conclusion.

(1 Mark).

c) What is the "resolution" of the above reasoning?   (1 Mark).

d) Explain why optimization performed by a compiler is often not as efficient as that done "by hand" by a programmer using a low-level language.   (2 Marks).

An experience motor mechanic uses a process of logical deductions to find out why a car will not start. She makes a series of simple tests, the results of which will eventually lead her to the cause of the problem. These tests are based upon her knowledge of a set of rules and facts.
For example. If the car has petrol, the headlights are dim, and the starter motor is turning the motor over very slowly, it is most probable that the problem is a flat battery or a faulty starter motor.
e) What type of computer program could be used to capture these rules and facts to produce a useful diagnostic "fault finding" application?   (1 Mark).

f) What are two advantages of using this type of program?   (2 Marks).

g) Why would the program be more useful if it explained how it reached a conclusion?

(3 marks)

h) Use the above description of the process the mechanic uses, to explain forward and backward chaining.   (6 Marks)

i) What is Polymorphism (1 Mark) and what is one advantage of allowing polymorphism in an object oriented language?   (1 Mark)

OR

Question 25

a) With commented steps showing all your working, demonstrate how you can perform binary subtraction of fifty from one hundred using two's complement representation. (2 Marks).

b) Draw up and complete a truth table for the following circuit. (2 Marks).


```
1 = true
0 = false
```
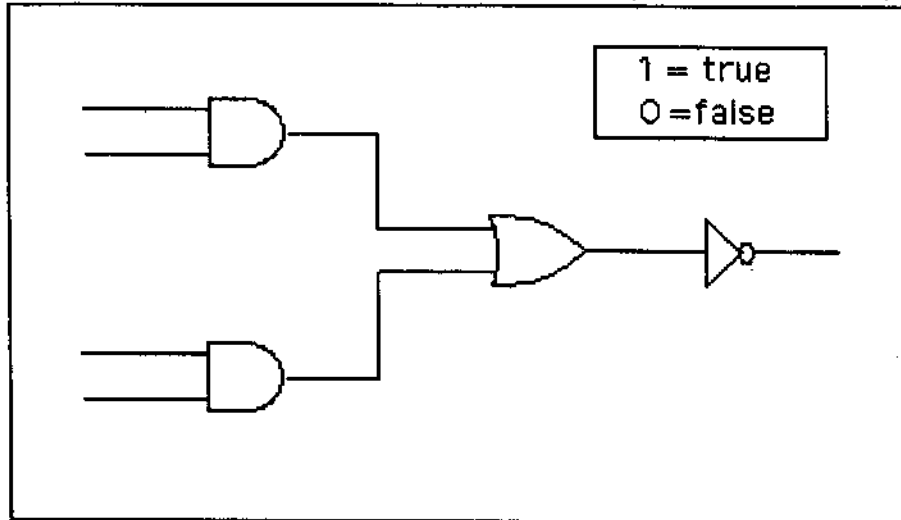
c) Represent 5.75 using 4 bits for the whole number and 4 bits for the fractional part in fixed-point binary representation. (2 Marks).

d) Why are flip-flops used as the memory circuits to store data? (2 Marks).

e) Draw a diagram to indicate how half adders are connected to form a full adder circuit (2 Marks)

f) What ASCII character is often used, in the data stream sent to a hardware device, to distinguish between data characters and control characters? (1 Marks). Give an example of its use (1 Mark).

g) A programmer wishes to capture measurements from a simple temperature gauge, which outputs continuously variable data. What device will be necessary to convert the data to a digital form for storage in a computer hard drive? (2 Marks).

h) Each key on an electronic piano keyboard can only be in one of two states (up or down). What type of data are they supplying? (1 Mark) What does the acronym MIDI stand for ? (1 Mark)

i) Why are stepper motors preferred for use in plotters, printers and very small robotic applications? (2 Marks).

j) What are two types of information contained in a typical header for the data stream in any device you have studied? (2 Marks).