Software Design and Development

Year 12

Half Yearly Examinations 2001

STUDENT NUMBER :

General Instructions

- Reading time – 5 minutes
- Working time – 3 hours
- Write using blue or black pen

Section I Pages 2 – 8
Total marks **(20)**
- Attempt Questions 1 – 20
- Allow about 35 minutes for this section
- Answer on the Answer Sheet provided at the back of this question booklet. This may be removed but clearly label it with your student number.

Section II Pages 9 – 14
Total marks **(80)**
- Attempt Questions 21 – 23
- Allow about 2 hours and 10 minutes for this section
- Answer all questions in this section in a separate writing booklet

1. To keep track of data elements during the software development cycle, a systems analyst could develop a
   (A) database.
   (B) data file.
   (C) data dictionary.
   (D) data flow diagram.

2. Which is the correct description of a binary search?
   (A) A binary search moves through ordered data sequentially.
   (B) A binary search moves through ordered data non-sequentially.
   (C) A binary search moves through unordered data sequentially.
   (D) A binary search moves through unordered data non-sequentially.

3. A project team is to develop computer software for a client. The client insists on early and ongoing demonstrations of the software so that requirements may be revised and changed if necessary.

   Which of the following is the most appropriate method to meet the client's needs?
   (A) Involve the client in the project team.
   (B) Extend the project development time.
   (C) Show the client structure charts and data flow diagrams.
   (D) Use a prototyping approach.

4. A system made up of individual programs should be tested with system test data in order to
   (A) check that the programs work together properly.
   (B) check that the programs can handle realistic amounts of data.
   (C) have the programs tested by a person other than the programmer who wrote them.
   (D) produce the user documentation.

5. The following source code fragment has an error in it.

   ```
   var  Array = new Array(5)
   ```

   the correct version of the code is
   ```
   var  my_array = new Array(5)
   ```

   The error in the first statement was probably due to
   (A) the fact that "Array "is a reserved word.
   (B) a syntax rule that the names of variables cannot contain capitals.
   (C) the incorrect spelling of "Array".
   (D) a runtime error occurring.

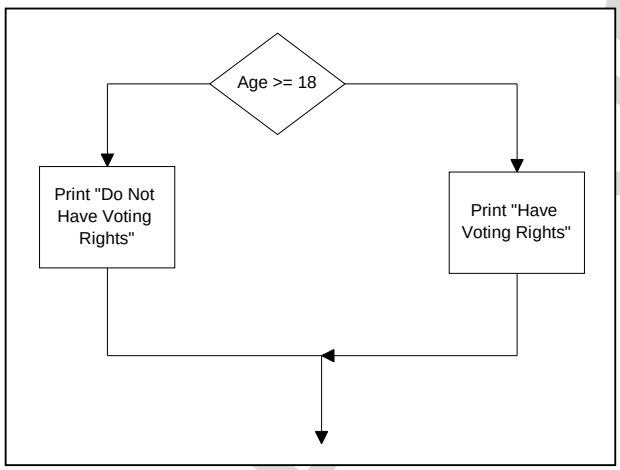
6. Refer to the following algorithm.

```
BEGIN
        set Count to 1
        get Mark
WHILE there are more Marks
        set Result [Count] to Mark
        increment Count by 1
        get Mark
ENDWHILE
END
```

What is the purpose of this algorithm?

(A) To store marks in a data file
(B) To count the number of marks
(C) To fill an array with marks
(D) To store marks as a simple variable

7. Refer to the following fragment of a flowchart.



This flowchart contains

(A) a Boolean operator, an output statement, and a variable.
(B) a relational operator, an output statement, and a variable.
(C) an assignment statement, a Boolean operator, and a variable.
(D) an arithmetic operator, a relational operator, and an assignment statement.

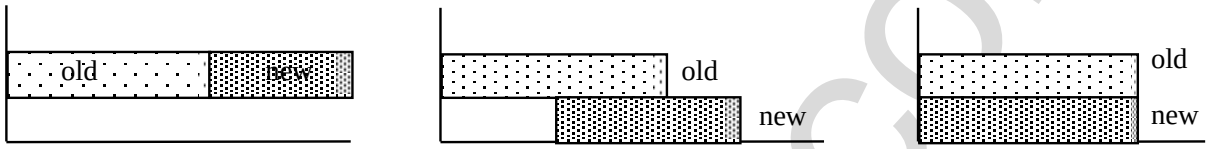
8. WHILE NOT Found OR NOT EOF() *EOF – means End of file

The above statement is part of an algorithm for searching an array. The algorithm will ..

(A) terminate successfully if both Found and EOF have a value of false
(B) terminate if one Boolean is true.
(C) loop forever if EOF is reached.
(D) loop forever if the search is not successful

9. The differences between BNF and EBNF are..
   (A) EBNF is graphically based using triangles, squares and arrows to represent syntax.
   (B) EBNF allowed the use of repetition.
   (C) EBNF dropped the use of the "|" bar symbol for grouping.
   (D) EBNF groups elements using [ ] square braces.

10. From left to right these charts show



   (A) direct, parallel and dual conversion.
   (B) dual, phased and direct conversion.
   (C) direct, phased and dual conversion.
   (D) dual, phased and parallel conversion

11. Issues of **equity** in program design are concerned primarily with

   (A) fairness.
   (B) reliability of data.
   (C) validity of data .
   (D) rights.

Questions 12 and 13 refer to the following algorithm, written here in pseudocode.

```
BEGIN
    set A to 5
    read B
        WHILE B<>A
            set B to B + A
            print B
        ENDWHILE
    print A
END
```

12. If the value of B is input as –20, the output from this algorithm will be

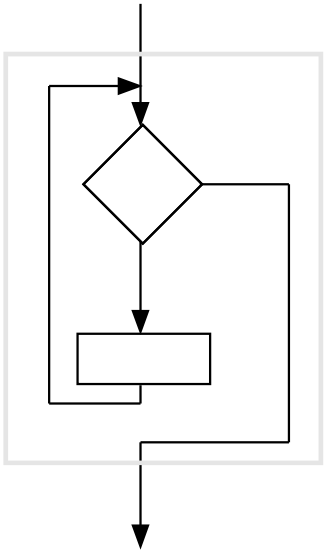
    (A) –15 –10 –5 0 5
    (B) –15 –10 –5 0 5 5
    (C) –20 –15 –10 –5 0 5
    (D) an endless set of integers each 5 larger than the previous integer.

13. How many iterations of the WHILE loop are executed in the algorithm above if B is input as –20

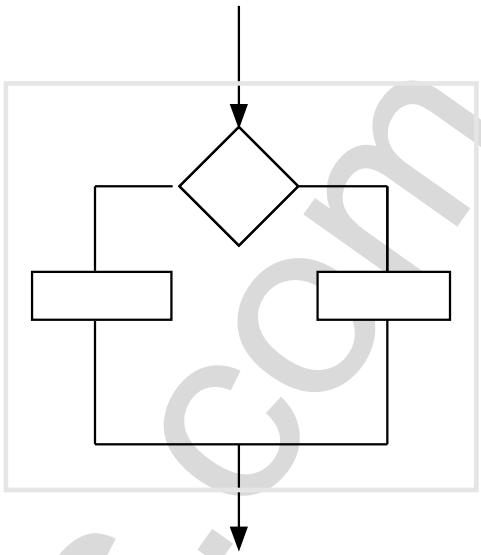
    (A) infinite
    (B) 4
    (C) 5
    (D) 6

14. Which of the following flowcharts shows the REPEAT UNTIL control structure.

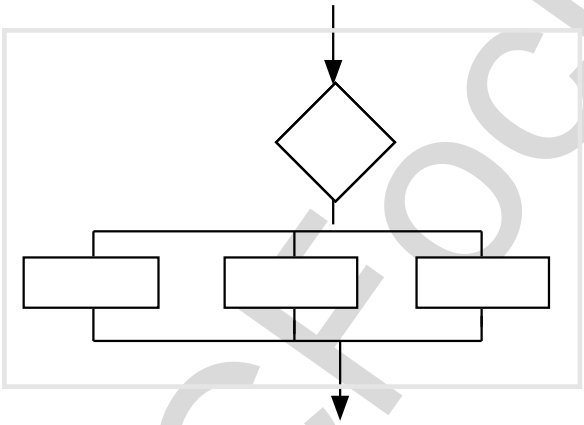
(A)



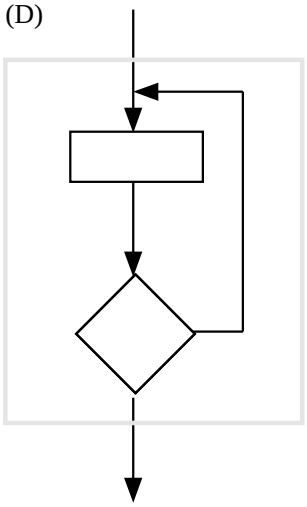
(B)



(C)



(D)



15. Errors which involve incorrect placement of reserved words are most likely

(A) logical errors.
(B) variable errors.
(C) syntax errors.
(D) pseudocode errors.

16. Read the following fragment of a program.

```
get hours_worked
multiply hours_worked by rate giving total_pay
multiply total_pay by tax_rate giving tax_payable
subtract tax_payable from total_pay giving net_pay
```

Changing the name of the variable 'rate' to 'hourly_rate' in the second line would improve the

(A) online documentation.
(B) internal documentation.
(C) intrinsic documentation.
(D) listing documentation.

17. What is the most likely consequence of a single software developer having a excessively large market share?

(A) Reduction in software quality and quantity
(B) Innovative software solutions are encouraged
(C) Software is competitively priced
(D) Software packages that have similar 'look and feel'

18. A data-entry operator is entering the results of a survey into a database. One of the survey questions asked people to choose several items from a list. The screen element that the data-entry operator would find most convenient for entering the data from this question would be a set of

(A) icons.
(B) windows.
(C) check boxes.
(D) radio buttons.

19. A program is sold with a software licence that prohibits the work being copied or converted into another form, except for the purposes of backup.

Which of the following **is allowed**?

(A) Sending the program to someone else in an e-mail message
(B) Decompiling the program to see it in a high-level language
(C) Saving the program on a disk, which is stored but not used
(D) Changing the program so that it runs on a different platform

20. Refer to the following module, 'age', called from the mainline of an algorithm.

```
BEGIN SUBPROGRAM age (number, target, result)
        Count = 0
        result = false
        REPEAT
                OUTPUT "Guess my age"
                INPUT guess
                        add 1 to Count
                IF guess = target THEN
                        result = true
                END IF
        UNTIL Count > number OR result = true
        RETURN result
END SUBPROGRAM age (number, target, result)
```

The use of the terms *number, target and result* in the first line show examples of

(A) Parameters being passed to the module.
(B) The variables that are required in the module
(C) The variables being declared as Integers.
(D) The parameters being declared as Integers.

Section II

Total marks (80)
Attempt Questions 21 – 23
Allow about 2 hour and 10 minutes for this section

Answer each question in a SEPARATE writing booklet. Extra writing booklets are available.

If you include diagrams in your answer, ensure that they are clearly labeled.

Marks **Question 21** (25 marks) Use a SEPARATE writing booklet.

6 (a) Process diaries (log books) and CASE tools such as Flowcharter and Turboproject are both used during the software development cycle.

(i) At which point in the software development cycle is each likely to be utilized, and for what purpose are each used ?

(ii) State the two advantages of using EACH of these in the software development cycle.

3 (b) Draw a Gantt chart that documents the major milestones (events) of the project you are currently undertaking. Include details specific to your project.

8 (c) A teacher requires a program that calculates the position, or rank, of each student based on their examination mark. Students who have achieved the same examination mark get the same rank.

```
BEGIN MAINPROGRAM
        Get Student Data
        Sort Examination Marks Descending
        Assign Ranks
        Display Names And Ranks
END MAINPROGRAM
```

The main program is shown above.

The following data is required to be stored as a record data structure; *Student Names, Examination Marks and Positions.*

(i) Why is the record data structure the most appropriate to use in this situation ?

(ii) What data types would be used to store the required data items within the record ?

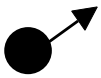
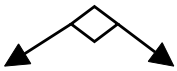
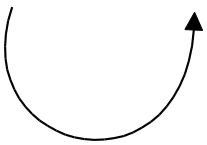
(iii) A sorting algorithm is required to sort the data in **DESCENDING ORDER**. Using a bubble sort, write **just the section** of the bubble sorting algorithm that we would use to swap data items when they are processed.

Marks

8 (d) In analysis the problem several methods can be used, including, Data flow diagrams, structure charts and storyboards.

(i) The following table is a summary show the symbols used in one of these methods.

a. For which analysis method are these symbols used?
b. Copy this table into your answer booklet and for each of the symbols briefly explain its purpose

Symbol	Meaning
	
	
	
	

(ii) Storyboards can be of three main types.

a. What is the main purpose of a storyboard ?
b. What are the main features that a storyboard should show ?
c. Using diagrams and words, briefly explain the difference between a *Linear Storyboard* and a *Network Storyboard*

Question 22 (30 Marks) Use a SEPARATE writing booklet.

Marks

2 (a) A programmer is testing a program. Although the program worked with one set of test data, it appears to do nothing when processing another set of test data. Describe TWO techniques that the programmer could use to debug the program by inserting additional code into the program.

6 (b) A well-documented system needs a number of *external documents* to enable it to be effectively implemented, used, and maintained.

(i) Briefly describe TWO of these documents. In your answer, name the document and state the purpose of the documentation and who the documentation is produced

(ii) In addition to the external documentation, a piece of software will often include on-line documentation to assist the user.

Briefly describe TWO different forms of on-line documentation. In your answer describe how the mechanism works and what information should be contained.

6 (c) The quality of user-interface screens contributes to the quality of the software.

(i) Briefly describe the ways in which screen design can affect the quality of software.

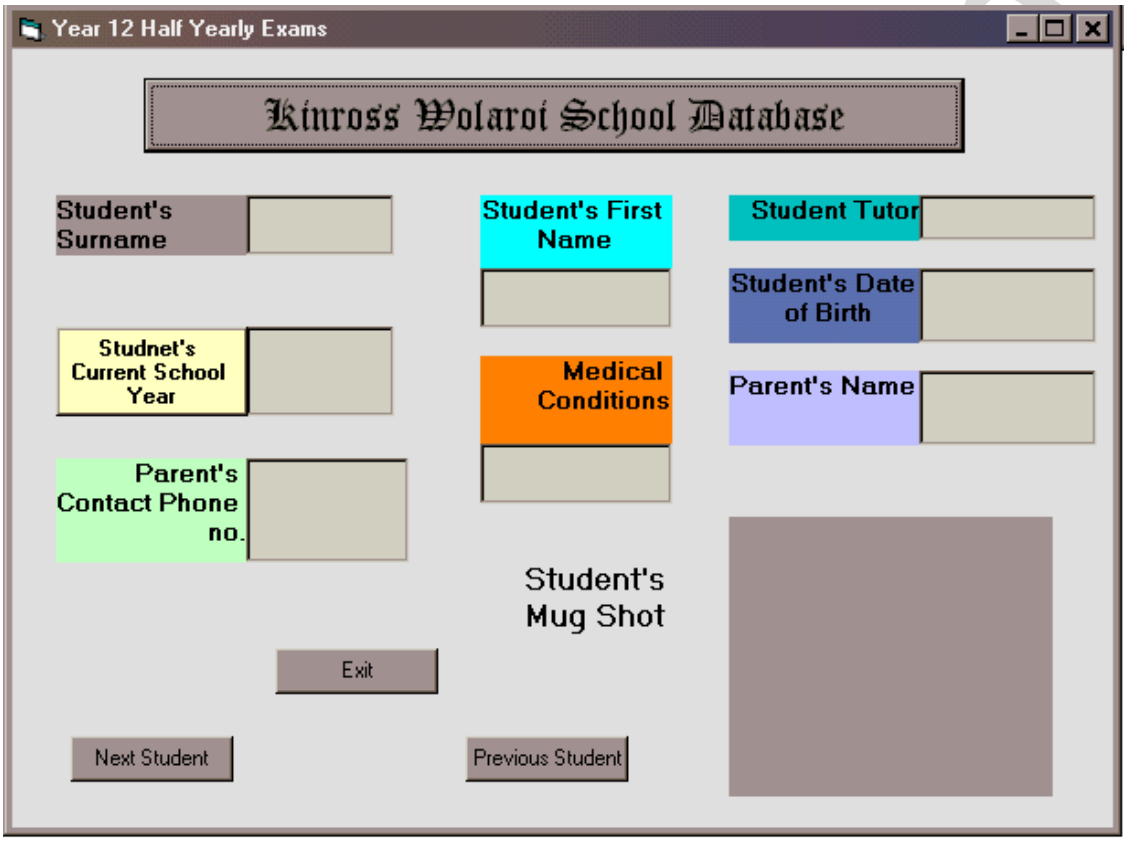
(ii) Major screen-design principles relate to:

i. enhancing legibility and clarity;
ii. the structural organization of a screen;
iii. the delineation of areas on a screen.

Select FOUR features of a well-designed screen, and explain how each feature contributes to implementing the relevant principles.

Marks
4

(d) For the screen at the right, redesign it using some of the major features mentioned in part (c) giving explanations of why the feature you are changing is unsatisfactory in its present form.



Marks

12

(e) A government grant for athletes is based on family income and the age of the athlete. If the family income is $25 000 or less, they receive a base grant plus the difference between $25 000 and the family income. If the athlete is 18 or younger, the base grant is $5 000; otherwise it is $10 000. If the family income is larger than $25 000, they receive a total grant of $6 000 if the athlete is 18 or younger; otherwise they receive a total grant of $12 000.

(i) Construct an IPO chart/table for this problem

(ii) Copy the table below into your answer booklet and design a set of test data pairs that could be used to check an algorithm written to calculate the grant payable to each athlete. Justify the inclusion of each pair of values. You need only test for positive values

Data Set		Base Grant Payable	Reasons for Inclusion of this Data set
Age	**Income**		

(iii) Construct an algorithm in either flowchart and pseudocode methods to show a solution for this problem.

Question 23 (25 Marks) Use a SEPARATE writing booklet.

Marks

3 (a) When developing software, the developer(s) should consider many issues that are associated with its development. For each of these issues, explain why and how these issues are dealt with in the development of any software package.

(i) Use of already existing code and using it in the project's development
(ii) Software's reliability and consistent functioning
(iii) Accessibility to the software and its various features by as many groups in the community as is possible.

4 (b) Software can be developed *in house* or it may be *outsourced*.

(i) Explain what is meant by "in house"
(ii) Explain what is meant by outsourcing.
(iii) Evaluate the benefits of outsourcing over in house development.

8 (c) Microfine High School is updating the school's word processing software across both the students and teaching/administrative populations. The IT manager has a number of ways in which the software may be replaced, direct, parallel, pilot and phased.

(i) Evaluate which of these methods would be most suitable for introducing the new software to the administrative personnel. Stating a reason for the choice of method
(ii) Evaluate which of these methods would be most suitable for introducing the new software to the student population personnel. Stating a reason for the choice of method
(iii) Discuss two of the issues that are needed to be considered in the OVERALL conversion process. Are these issues different for each "population" Why ?

9 (d) For the following data set illustrate how each of the three sorting methods; bubble sort, selection sort and insertion sort process and sort the data. In your answer give a clear indication of the data that is being compared and the result of the comparison being made. (Hint draw up a table to help with your answer). Clearly label the sort being answered.

5	9	6	3

1 (e) Which method is used for a small set of number and which is used for a large set of numbers?