

section II

Total marks (60)

Attempt Questions 21-28

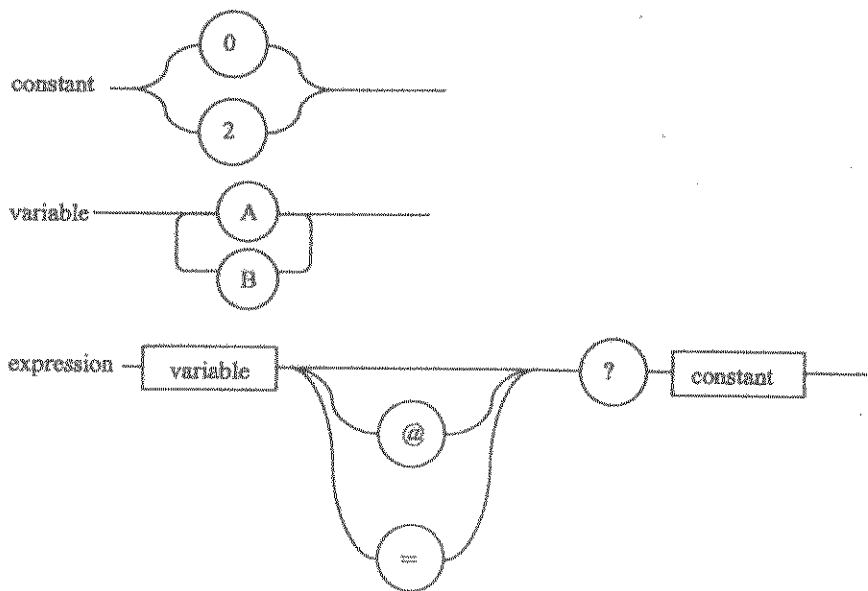
Allow about 1 hour and 50 minutes for this section

Answer in the spaces provided on this paper.

Question 21. (9 marks)

(i) Describe ONE technology used to combat software piracy. (2 marks)

(ii) Consider the following Railroad diagram



(i) Write an example of a valid expression using the above definitions. (1 mark)

(ii) Using the diagrams above, write the EBNF definitions of the THREE items. (3 marks)

(iii) Railroad diagrams and EBNF are metalanguages. Explain how metalanguages are used in the development of software solutions. (3 marks)

Question 22 (6 marks)

(i) Compare and Contrast logic errors with run time errors. (3 marks)

(ii) Describe TWO techniques for debugging logic errors within source code. (3 marks)

Question 23 (5 marks)

You have organised to meet your friend at a football game. You call him on the mobile and he says that he is standing in line waiting to buy tickets and he will be wearing a very distinctive green hat. The following algorithm demonstrates his search.

```
1 BEGIN
2 Set Found to false
3 Set More_people to true
4 Get a description of person you are looking for
5 WHILE Found is false OR More_people is true
6     Stand in front of first person in the line
7     IF the person in front of you is not the friend you are looking for THEN
8         stand in front of next person in the line
9     ENDIF
10 ENDWHILE
11 IF Found = false THEN
12     You have found your friend
13 ELSE Call your friend on the mobile
14 ENDIF
15 END
```

(i) There are TWO errors in the algorithm. Locate TWO errors and explain the effect they have on the algorithm. (3 marks)

- (ii) The algorithm above uses a linear search. Explain why this method of searching was used rather than a binary search method. (2 marks)

Question 24 (10 marks)

A new project requires a large team of programmers, system analysis and project managers and is expected to take more than 12 months to complete.

- (i) Explain the stages of program development that would be typically required to complete a large project. (3 marks)

- (ii) Outline the role of the systems analysts in a large project. (2 marks)

- (iii) List TWO types of source code documentation techniques that can be used by team members and give examples on how they are used. (3 marks)

- (iv) Briefly explain the responsibilities that programmers have in developing software. (2 marks)

Question 25 (7 marks)

A birthday notification system is currently under development. The program will display a list of people who have birthdays within the current month. The data for this system is read from a text file containing names and birthdates. A sample file is reproduced below:

David, 14,6, 2002

James, 27, 11, 2003

Sonia, 2, 2, 2002

Lilly, 17, 8, 2002

- (i) Design and describe a possible data structure that could be used to store the data retrieved from the text file. Justify your choice of data structure. (3 marks)

Question 26 (6 marks)

Consider the algorithm below. The line numbers are for referencing purposes only.

```
1. BEGIN PayRollMain (Validated, EmployeeName, NoOfHours, PayRate)
2.   Set Validated to False
3.   WHILE Validated = False
4.     GetEmployeeDetails (EmployeeName, PasswordEnter)
5.     VerifyEmployee (PasswordEnter, Validated, EmployeeName)
6.   ENDWHILE
7.   GetWorkDetails (EmployeeName, NoOfHours, PayRate)
8.   CalculatePay (NoOfHours, PayRate, Pay)
9. END

10. BEGIN CalculatePay (NoOfHours, PayRate, Pay, EmployeeName)
11.   Set Pay to NoOfHours * PayRate
12.   PrintPayDetails (EmployeeName, Pay)
13. END

14. BEGIN GetEmployeeDetails (EmployeeName, PasswordEnter)
15.   Get EmployeeName
16.   Get PasswordEnter
17. END

18. BEGIN VerifyEmployee (PasswordEnter, Validated, EmployeeName)
19.   Get Stored Password for this EmployeeName
20.   IF StoredPassword = PasswordEnter THEN
21.     Set Validated to True
22.   ENDIF
23. END

24. BEGIN GetWorkDetails (EmployeeName, NoOfHours, PayRate)
25.   Display "Using Temporary data while testing"
26.   Set NoOfHours to 10
27.   Set PayRate to 20
28.   Display EmployeeName, NoOfHours, PayRate
29. END

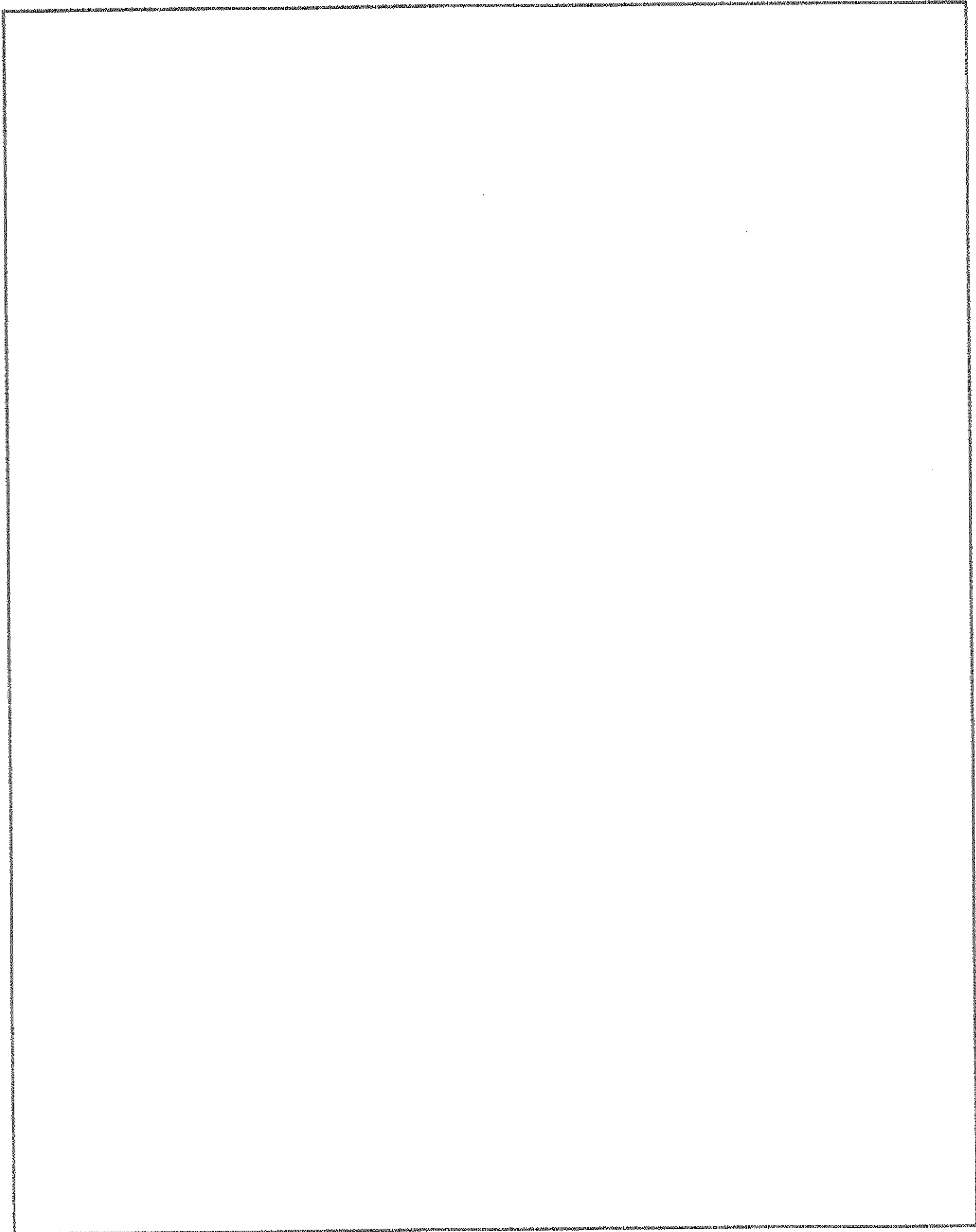
30. BEGIN PrintPayDetails (EmployeeName, Pay)
31.   Print EmployeeName, Pay
32. END
```

The algorithm above represents a developer's work towards defining the processes involved in calculating and printing pay details for employees.

(i) Identify a flag used in the algorithm. (1 mark)

(ii) By referring to the line numbers in the algorithm above identify a stub. (1mark)

- (iii) Draw a structure Diagram which corresponds to the whole algorithm above. (4 marks)

A large, empty rectangular box with a thin black border, intended for the student to draw a structure diagram. The box occupies most of the page's vertical space below the question.

Question 27 (4 marks)

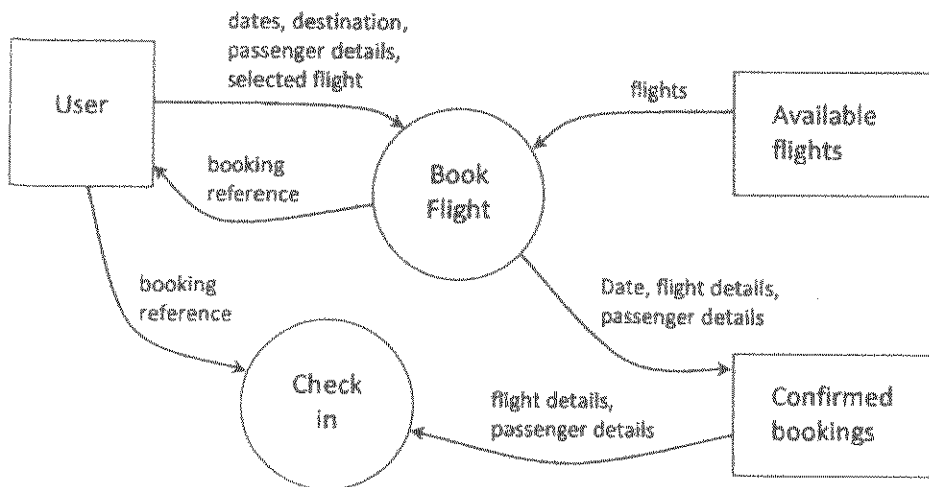
Your school is considering the implementation of a new online learning management system (LMS). You have the choice between purchasing a commercial product, which will mostly meet user needs, versus developing your own system from scratch, which should meet all needs.

Outline different factors the school should consider in choosing between the systems. (4 marks)

Question 28. (13 marks)

An airline is upgrading their booking and check-in systems.

Their new system is represented by the following data flow diagram (DFD).



- (i) Construct an additional DFD to refine the Book Flight process into two processes called Search Flight and Reserve Seat. (3 marks)

(ii) Create screen designs as a storyboard for the Book Flight process. (4 marks)

(iii) Describe TWO accessibility considerations when developing the system. (3 marks)

(iv) The developers have determined that the confirm bookings data store should be a random access file not a sequential file. Justify the decision. (3 marks)

section III

Total marks (20)

Attempt Question 29

Allow about 35 minutes for this section

Answer in the spaces provided on this paper.

Question 29-The Interrelationship between Software and Hardware

(a) Distinguish between ASCII and Unicode. (2 marks)

(b) With reference to specific data types, show how the byte 01000110 could be interpreted in TWO different ways. (2 marks)

- (c) Dominic was asked to calculate the answer to a problem using a 4 bit 2's complement integer notation. The problem was:

$$4 - 7 = ?$$

Dominic came up with the answer 13.

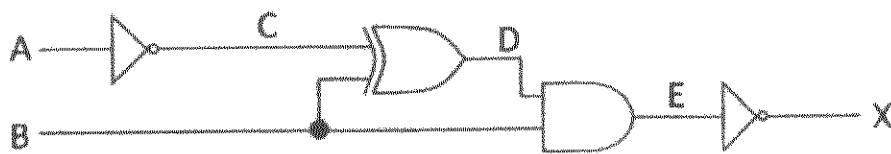
- (i) Explain where he went wrong with his calculations. (2 marks)

- (ii) Demonstrate how you would come up with the correct answer using this 4-bit 2s complement. (show all working) (2 marks)

- (d) Describe in words the function of an XOR gate. (2 marks)

- (e) Represent -12.25 using single precision floating point representation. In your working identify the different components of the single precision floating point representation. (3 marks)

- (f) Complete the truth table below for the following circuit and name the single gate that could replace this circuit. (3 marks)



A	B	C	D	E	X
0	0				
0	1				
1	0				
1	1				

Name of replacement gate: _____

- (g) A software development company is developing an application to maintain a building at a defined constant temperature. A data stream will be generated and transmitted every minute from a device that measures and collects temperature readings from a series of temperature sensors located throughout the building.

This data stream will be read by the new application. The application then interprets the data stream and generates output to control the heating and cooling devices located throughout the building.

Assuming there are a maximum of 255 temperature sensors able to be managed by the transmitting device, design and fully label an appropriate specification for the data stream that is sent to the application. (4 marks)