
COMPUTER SCIENCE

9608/04

Paper 4 Further Problem-solving and Programming Skills

For Examination from 2015

SPECIMEN MARK SCHEME

2 hours

MAXIMUM MARK: 75

This document consists of **9** printed pages and **1** blank page.

- 1 (a) *Mark as follows:*
- | | |
|--------------------------------|-----|
| High ← 63 | [1] |
| X = 0 | [1] |
| High ← Middle - 1 | [1] |
| One mark for each correct line | |
-
- (b) (i) ordered / in order [1]
- (ii) 6 [1]
- (iii) 0 [1]
- | | |
|-----------------------------------|-----|
| item not present in array | [1] |
| non zero | [1] |
| position of the item in the array | [1] |
-
- (c) (i) e.g. in Python:
- | | |
|---------------------------------------|-----|
| def BinarySearch(Low, High): | [1] |
| global Found | |
| if Low>High: |) |
| return |) |
| Middle=int((High+Low)/2) | |
| if SearchData[Middle] == SearchItem: |) |
| Found = Middle |) |
| elif SearchData[Middle] < SearchItem: |) |
| BinarySearch(Middle + 1, High) |) |
| elif SearchData[Middle] > SearchItem: |) |
| BinarySearch(Low, Middle - 1) |) |
| return | [1] |
-
- (d) BinarySearch(1, 63) [1]

[Total: 15]

2 (a)

	0	1	2	3	4	5	6	7	8
Conditions	Group 1 tests	Y	Y	Y	Y	N	N	N	N
	Group 2 tests	Y	Y	N	N	Y	Y	N	N
	Group 3 tests	Y	N	Y	N	Y	N	Y	N
Actions	Accepted	Y							
	Repair		Y	Y					
	Rejected				Y	Y	Y	Y	Y

correct column 1

[1]

correct columns 2 and 3

[1]

correct column 4

[1]

correct columns 5–8

[1]

(b)

	0	1	2	3	4	5			
Conditions	Group 1 tests	Y	Y	Y	Y	N			
	Group 2 tests	Y	Y	N	N	-			
	Group 3 tests	Y	N	Y	N	-			
Actions	Accepted	Y							
	Repair		Y	Y					
	Rejected				Y	Y			

correct column 1

[1]

correct column 2

[1]

correct column 3

[1]

correct column 4

[1]

correct column 5

[1]

(c) e.g. in Python:

```
def Reject():
    if ((G1Tests() == True and G2Tests() == False and
        G3Tests() == False) or G1Tests() == False):
        return True
```

correct function header

[1]

correct if statement

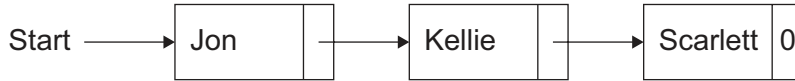
[1]

correct return statement

[1]

[Total: 12]

3 (a)



Mark as follows:

Three correct items

[1]

Indication of correct order with start and termination

[1]

(b) Type ListNode
 Pointer as Integer
 Name As String
 EndType

Mark as follows:

Record structure definition

[1]

Pointer field definition

[1]

Node data definition

[1]

(c) Dim NameList[1..50] As ListNode

Mark as follows:

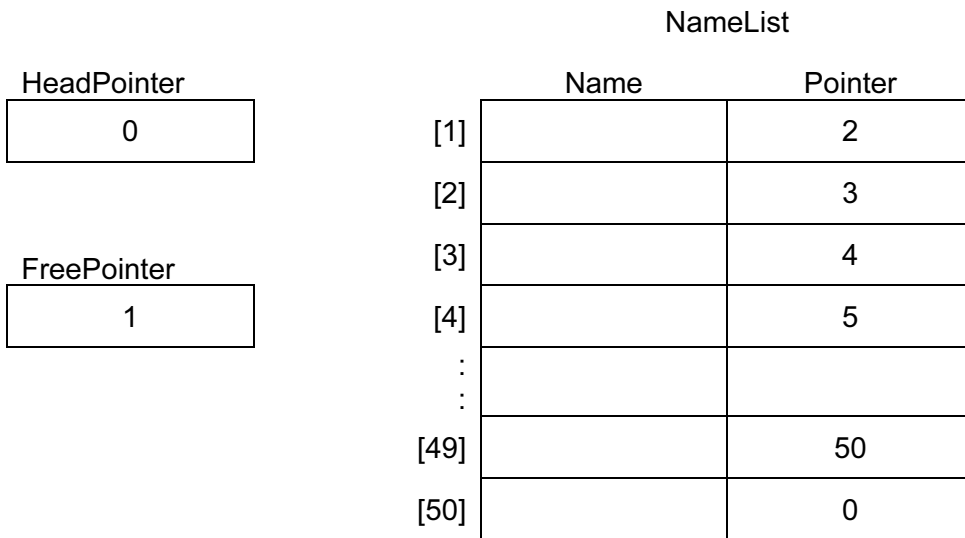
Appropriate size of array

[1]

Use of user defined record type

[1]

(d) (i)



Mark as follows:

HeadPointer

[1]

FreePointer

[1]

Pointers[1] – [49]

[1]

Pointer[50]

[1]

```

(ii) FOR Index ← 1 TO 49
      NameList[Index].Pointer ← Index + 1
    ENDFOR
    NameList[50].Pointer ← 0
    HeadPointer ← 0
    FreePointer ← 1

```

Mark as follows:

Correct FOR loop [1]
 Correct setting of Pointer[50], HeadPointer and FreePointer [1]

```

(e) (i) 01 PROCEDURE AddItem(NewItem)
        02 //
        03   NameList[FreePointer].Name ← NewItem
        04   CurrentPointer ← HeadPointer [1]
        05 //
        06   REPEAT
        07     IF NameList[CurrentPointer].Name < NewItem [1]
        08     THEN
        09       PreviousPointer ← CurrentPointer
        10       CurrentPointer ← NameList[CurrentPointer].Pointer [1]
        11     ENDIF
        12   UNTIL NameList[CurrentPointer].Name > NewItem
        13 //
        14   IF CurrentPointer = HeadPointer
        15     THEN
        16       NameList[FreePointer].Pointer ← HeadPointer
        17       HeadPointer ← FreePointer
        18     ELSE
        19       NameList[FreePointer].Pointer
        20         ← NameList[PreviousPointer].Pointer
        21       NameList[PreviousPointer] ← FreePointer
        22     ENDIF
        23   FreePointer ← NameList[FreePointer].Pointer
        24 ENDPROCEDURE

```

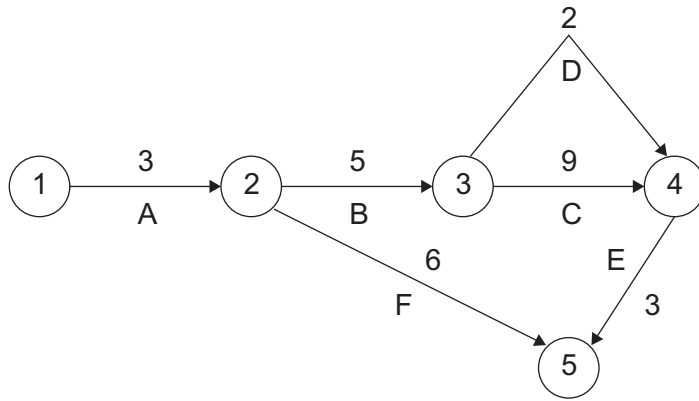
(ii) New item placed in node at head of Free List [1]

(iii) Loop that repeats until position of new item located [1]
 Records current pointer and then updates current pointer [1]

(iv) Check to see whether new item is first in linked list [1]
 If first item then place item at head of list [1]
 If not first item then adjust pointers to place it in correct position in list [1]

[Total: 22]

4 (a)



1 mark for each correctly labelled activity – max 4 marks

[max 4]

(b) (i) 1 – 2 – 3 – 4 – 5

[1]

(ii) 20

[1]

(c) (i) 8

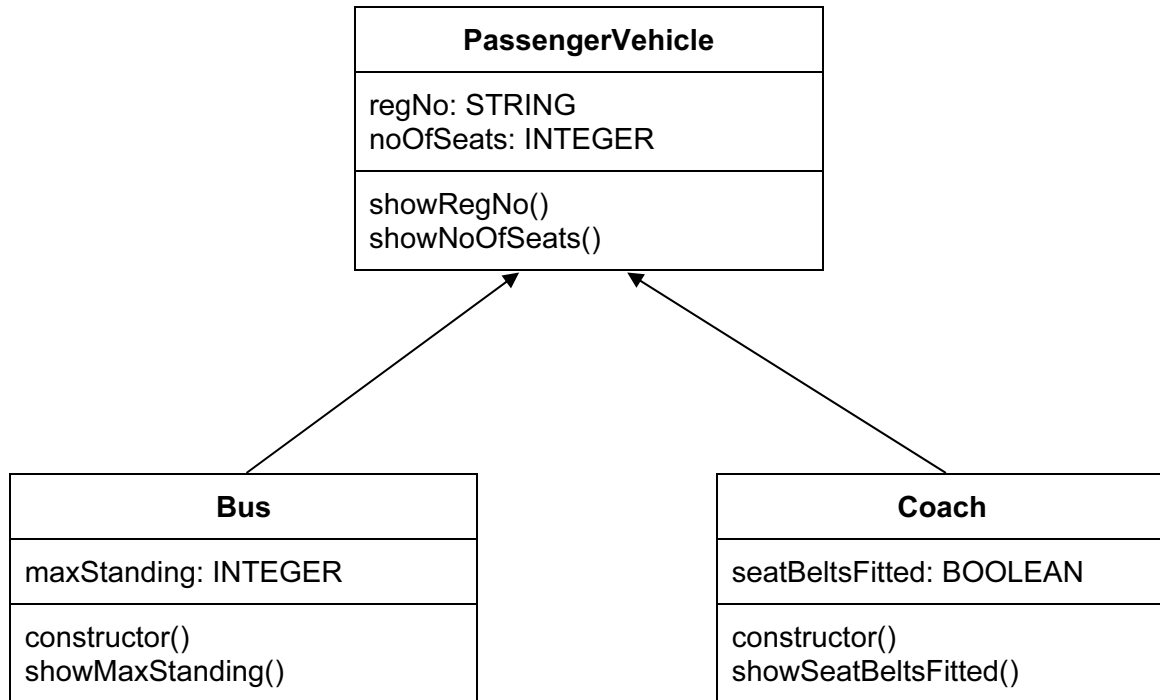
[1]

(ii) 17

[1]

[Total: 8]

5 (a)



Mark as follows:

noOfSeats declaration and associated show method in PassengerVehicle [1]

inheritance arrows [1]

constructor method in Coach [1]

seatBeltsFitted declaration and associated show method in Coach [1]

(b) e.g. in Python:

```

class PassengerVehicle():
    def __init__(self, regNo, noOfSeats):
        # Sets all the initial values
        self.__regNo = regNo
        self.__noOfSeats = noOfSeats

    def showRegNo(self):
        print("Registration No: ",self.__regNo)

    def showNoOfSeats(self):
        print("No of seats: ",self.__noOfSeats)
  
```

Mark as follows:

data declarations [1]

use of __ in identifiers to give "private" attribute [1]

use of 'self' parameter [1]

showRegNo function [1]

showNoOfSeats function [1]

e.g. in Visual Basic:

```

MustInherit Class PassengerVehicle
    Protected regNo As String
    Protected noOfSeats As Integer

    Public Sub showRegNo()
        Console.WriteLine(regNo)
    End Sub

    Public Sub showNoOfSeats()
        Console.WriteLine(noOfSeats)
    End Sub

End Class

```

Mark as follows:

MustInherit	[1]
data declarations	[1]
protected	[1]
showRegNo function	[1]
showNoOfSeats function	[1]

(c) e.g. in Python:

```

class Bus(PassengerVehicle):
    def __init__(self, regNo,
noOfSeats, maxStanding):
        super().__init__(regNo, noOfSeats)
        self.__maxStanding = maxStanding

    def showMaxStanding (self):
        print("No of standing passengers: ", self.__maxStanding)

```

Mark as follows:

inheritance	[1]
__init__ function header	[1]
use of __init__ from superclass	[1]
initialisations in __init__ function	[1]
showMaxStanding function	[1]

e.g. in Visual Basic:

```
Class Bus
    Inherits PassengerVehicle
    Private maxStanding As Integer
    Public Sub New(ByVal regNoValue As String, ByVal
        noOfSeatsValue As Integer, ByVal
        maxStandingValue As Integer)
        regNo = regNoValue
        noOfSeats = noOfSeatsValue
        maxStanding = maxStandingValue
    End Sub
    Public Sub ShowMaxStanding ()
        Console.WriteLine(maxStanding)
    End Sub
End Class
```

Mark as follows:

inheritance	[1]
private	[1]
Public Sub New header	[1]
Initialisations in Sub New	[1]
ShowMaxStanding function	[1]

(d) (i) e.g. in Python:

```
pv1 = Bus("NBR 123", 51,10) [1]
```

e.g. in Visual Basic:

```
Dim pv1 As Bus = New Bus("NBR 123", 51, 10) [1]
```

(ii) e.g. in Python:

```
pv1.showRegNo() [1]
```

```
pv1.showNoOfSeats() [1]
```

```
pv1.showMaxStanding() [1]
```

e.g. in Visual Basic

```
pv1.showRegNo() [1]
```

```
pv1.showNoOfSeats() [1]
```

```
pv1.showMaxStanding() [1]
```

[Total: 18]

