

6(a)	1 mark for correct answer Type of compression: lossy Justification: There will be fewer samples per second, so data will be permanently lost // There will be fewer samples per second, so the original sound cannot be re-created																																													
6(b)	1 mark for correct words in the correct order <table><tr><td>Binary Value</td><td>0011 1000</td><td>0011 1100</td><td>0011 1110</td></tr><tr><td>Word</td><td>Science</td><td>is</td><td>Amazing!</td></tr></table>	Binary Value	0011 1000	0011 1100	0011 1110	Word	Science	is	Amazing!																																					
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6(c)(i)	1 mark for correct answer parity bit ↓ <table><tr><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td></tr></table>	0	1	0	1	1	1	0	0																																					
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6(c)(ii)	1 mark for correct answer parity bit ↓ <table><tr><td></td><td>1</td><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td></tr><tr><td></td><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td></td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td></tr><tr><td></td><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td></tr><tr><td>parity byte→</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr></table>		1	0	1	1	0	1	1	1		0	1	1	1	0	0	0	0		0	0	0	1	1	0	1	1		0	1	1	1	0	1	0	0	parity byte→	1	0	1	0	0	0	0	0
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parity byte→	1	0	1	0	0	0	0	0																																						
6(d)	1 mark for the working 1 mark for the correct answer Working: $(1000 * 2000 * 16) / (8 * 1000 * 1000)$ // $(1000 * 2000 * 2 / (1000 * 1000))$ Answer: 4 megabytes																																													

2(a)	1 mark each - Queue declared as a (global) 1D array of 100 string elements all initialised to "" - QueueHead and QueueTail initialised with -1, NumberItems initialised to 0 Example program code Java <pre>public static String[] Queue = new String[100]; public static Integer QueueHead; public static Integer QueueTail; public static Integer NumberItems; for(int x = 0; x < 100; x++){ Queue[x] = ""; } QueueHead = -1; QueueTail = -1; NumberItems = 0;</pre> VB.NET <pre>Dim Queue(99) As String Dim QueueHead As Integer Dim QueueTail As Integer Dim NumberItems As Integer For x = 0 To 99 Queue(x) = "" Next QueueHead = -1 QueueTail = -1 NumberItems = 0</pre>
2(a)	Python <pre>global Queue, QueueHead, QueueTail, NumberItems Queue = [] for x in range(100): Queue.append("") QueueHead = -1 QueueTail = -1 NumberItems = 0</pre>

2(b)

1 mark each

- Function header (and end where appropriate) taking one (string) parameter **and** checking full **and** returning FALSE
- (otherwise) Storing parameter in QueueTail + 1
- Incrementing QueueTail and NumberItems
- (Dealing with first element) If QueueHead = -1 store 0 in QueueHead / increment QueueHead
- Return TRUE in all cases when inserted

Example program code.

Java

```
public static Boolean Enqueue(String TheData){
    if(QueueHead == -1){
        Queue[0] = TheData;
        QueueHead = 0;
        QueueTail = 0;
        NumberItems++;
        return true;
    }else if(QueueTail >= 99){
        return false;
    }else{
        Queue[QueueTail+1] = TheData;
        QueueTail++;
        NumberItems++;
        return true;
    }
}
```

2(b)

VB.NET

```
Function Enqueue(TheData)
    If QueueHead = -1 Then
        Queue(0) = TheData
        QueueHead = 0
        QueueTail = 0
        NumberItems += 1
        Return True
    ElseIf QueueTail >= 99 Then
        Return False
    Else
        Queue(QueueTail + 1) = TheData
        QueueTail += 1
        NumberItems += 1
        Return True
    End If
End Function
```

Python

```
def Enqueue(TheData):
    global Queue, QueueHead, QueueTail, NumberItems
    if(QueueHead == -1){
        Queue[0] = TheData
        QueueHead = 0
        QueueTail = 0
        NumberItems +=1
        return True
    elif QueueTail >= 99:
        return False
    else:
        Queue[QueueTail+1] = TheData
        QueueTail +=1
        NumberItems +=1
        return True
```

2(c)

1 mark each

- Function header (and end), checking if Queue is empty (NumberItems = 0 or QueueHead > QueueTail) **and** returning "False"
- (otherwise) returning Queue[QueueHead]
- Incrementing QueueHead, decrementing NumberItems

Example program code

Java

```
public static String Dequeue(){
    String ReturnValue;
    if(NumberItems == 0){
        return "False";
    }else{
        ReturnValue = Queue[QueueHead];
        QueueHead++;
        NumberItems--;
        return ReturnValue;
    }
}
```

VB.NET

```
Function Dequeue()

    If NumberItems = 0 Then
        Return "False"
    Else
        Dequeue = Queue(QueueHead)
        QueueHead += 1
        NumberItems -= 1
    End If
End Function
```

2(c)

Python

```
def Dequeue():
    global Queue, QueueHead, QueueTail, NumberItems
    if NumberItems == 0:
        return "False"
    else:
        ReturnData = Queue[QueueHead]
        QueueHead += 1
        NumberItems -=1
        return ReturnData
```

- 2(d) 1 mark each to max 5
- Procedure header (and end where appropriate)
 - Opening the file **and** closing the file (in appropriate place)
 - Looping until EOF // looping through each line ...
 - ... read in each value ...
 - ... calling Enqueue() with read in value and store/use return value
 - Exception handling with try except and appropriate output with all file access within try

Example program code

```
Java
public static void ReadData(){
    Boolean ReturnValue;
    Boolean FinishLoop = false;
    try{
        Scanner Scanner1 = new Scanner(new File("BinaryData.txt"));
        while(Scanner1.hasNextLine() && FinishLoop == false){
            ReturnValue = Enqueue(Scanner1.nextLine());
            if(ReturnValue.equals("False")){
                FinishLoop = true;
            }
        }
        Scanner1.close();
    } catch(FileNotFoundException ex){
        System.out.println("No file found");
    }
}
```

- 2(e) 1 mark each
- Procedure header (and end where appropriate), storing final string compressed data in global variable
 - Call Dequeue() **and** storing return value ...
 - ... repeatedly until the return value == "False"
 - Comparing new value with previous ...
 - ... maintaining counter of number of occurrences ...
 - ... appending digit and number of occurrences to a string without overriding

Example program code

```
Java
public static void Compress(){
    String First = Dequeue();
    String NewLine = "";
    Integer Count;
    String NextChar;
    while(NumberItems > 0 && First != "False"){
        Count = 1;
        NextChar = Dequeue();
        while(NextChar.equals(First)){
            Count++;
            First = NextChar;
            NextChar = Dequeue();
        }
        NewLine = First + Count;
        NewString = NewString + NewLine;
        First = NextChar;
    }
}
```

2(d) **VB.NET**

```
Sub ReadData()
    Dim ReturnValue As String
    Dim DataReader As New System.IO.StreamReader("BinaryData.txt")
    Dim FinishLoop As Boolean = True
    Do Until DataReader.EndOfStream Or FinishLoop = False
        ReturnValue = Enqueue(DataReader.ReadLine())
        If ReturnValue = False Then
            FinishLoop = False
        End If
    Loop
    DataReader.Close()
End Sub
```

Python

```
def ReadData():
    TheFile = open("BinaryData.txt")
    for Line in TheFile:
        ReturnValue = Enqueue(Line.strip())
        if ReturnValue == False:
            break

    TheFile.close()
```

2(e) **VB.NET**

```
Sub Compress()
    Dim First As String = Dequeue()
    Dim NewLine As String = ""
    Dim Count As Integer
    Dim NextChar As String
    While NumberItems > 0 And First <> "False"
        Count = 1
        NextChar = Dequeue()

        While NextChar = First
            Count += 1
            First = NextChar
            NextChar = Dequeue()
        End While

        NewLine = First & Count
        NewString = NewString & NewLine
        First = NextChar
    End While
```

Python

```
def Compress():
    global NewString
    First = Dequeue()
    NewString = ""
    while NumberItems > 0 and First != "False":
        Count = 1
        NextChar = Dequeue()
        while NextChar == First:
            Count += 1
            First = NextChar
            NextChar = Dequeue()
        NewLine = First + str(Count)
        NewString = NewString + NewLine
        First = NextChar
```

2(f)(i)	1 mark each • Calling ReadData () then Compress () • Outputting compressed string Example program code Java <pre>public static void main(String args[]){ NewString = ""; for(int x = 0; x < 100; x++){ Queue[x] = ""; } QueueHead = -1; QueueTail = -1; NumberItems = 0; ReadData(); Compress(); System.out.println(NewString); }</pre> VB.NET <pre>Sub Main() NewString = "" For x = 0 To 99 Queue(x) = "" Next QueueHead = -1 QueueTail = -1 NumberItems = 0 ReadData() Compress() Console.WriteLine(NewString) Console.ReadLine() End Sub</pre>
2(f)(i)	Python <pre>NewString = "" Queue = [] for x in range(100): Queue.append("") QueueHead = -1 QueueTail = -1 NumberItems = 0 ReadData() Compress() print(NewString)</pre>
2(f)(ii)	1 mark for screenshot showing output Example 