



**Ain Shams University**

**Faculty Of Engineering**

**CSE 365**

**Computer Vision**

**OCR Final Project**

*Submitted By:*

Andrew Sameh Labib                      16P6007

Nayer Nabil George                      16P6054

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## Solution :

```
import cv2
import numpy as np
import math

def rotateImage(image, angle): # image rotation function by calculating the center of
the image and then rotate it
    image_center = tuple(np.array(image.shape[1::-1]) / 2) # calculating the center
of image
    rot_mat = cv2.getRotationMatrix2D(image_center, angle, 1.0) # calculating the
suitable rotation matrix
    result = cv2.warpAffine(image, rot_mat, image.shape[1::-1],
flags=cv2.INTER_LINEAR) # Getting the final image as a result
    return result

file = open("Output.txt","w+") # Opening the output file to use it
img = cv2.imread('test_sample2.jpg', 0) # Reading the input image
img = cv2.resize(img,(481,680)) # Resizing the image
img = cv2.bitwise_not(img) # Inverting the image to be ready for applying some
operations

img_edges = cv2.Canny(img, 100, 100, apertureSize=3) # Edge detection
lines = cv2.HoughLinesP(img_edges, 1, math.pi / 180.0, 100, minLineLength=50,
maxLineGap=5) # Line detection
angles = []
for x1, y1, x2, y2 in lines[0]:

    angle = math.degrees(math.atan2(y2 - y1, x2 - x1)) # Calculating the angle of
rotation by calculating slope
    angles.append(angle)

median_angle = np.median(angles) # Getting the angle value to rotate the image

img = rotateImage(img,median_angle) # Image rotation function by passing the image
and the angle calculated before
img = cv2.resize(img,(481,680)) # Resizing again after rotation

ret, thresh = cv2.threshold(img,235,255,cv2.THRESH_BINARY) # Applying thresholding on
the image to get the needed information only
kernel = cv2.getStructuringElement(cv2.MORPH_ELLIPSE,(3,3))
eroded = cv2.erode(thresh,kernel)
eroded = cv2.dilate(eroded,kernel) # erosion to make sure there is no noise

answers = cv2.connectedComponentsWithStats(eroded, 4, cv2.CV_32S) # Function to
detect the components in the image after thresholding
answers = answers[2]
answers = answers[1:23]
j = 0
Question_no =
"1.1","1.2","1.3","1.4","1.5","2.1","2.2","2.3","2.4","2.5","2.6","3.1","3.2","3.3","
4.1","4.2","4.3",\
    "5.1","5.2"
```

```

for f in answers:
    if (f[1] == answers[0][1]):
        # answer_previous = i
        continue
    elif((f[1]<=answer_previous+3) & (f[1]>=answer_previous-3)):
        print("error")
        file.write("Rejected")
        file.close()
        cv2.destroyAllWindows()
    else:answer_previous = f[1]

for i in answers: # printing the answers detected from the image
    if i[1] == answers[0][1]:
        if (i[0] >= 353) & (i[0] <= 391):
            file.write("Gender: Male \r\n")
        elif (i[0] >= 392) & (i[0] <= 446):
            file.write("Gender: Female \r\n")
    if i[1] == answers[1][1]:
        # Continue semester values
        if (i[0] >= 145) & (i[0] <= 185):
            file.write("Semester: Fall \r\n")
        if (i[0] >= 190) & (i[0] <= 260):
            file.write("Semester: Spring \r\n")
        if (i[0] >= 290) & (i[0] <= 350):
            file.write("Semester: Summer \r\n")
    if i[1] == answers[2][1]:
        # Program value
        if (i[0] >= 120) & (i[0] <= 150) & ~(i[1] >= 140):
            file.write("Program: MCTA
\r\n===== \r\n"

"===== \r\n") #
done
    if (i[0] >= 159) & (i[0] <= 189) & ~(i[1] >= 140):
        file.write("Program: ENVER
\r\n===== \r\n"

"===== \r\n") #
done
    if (i[0] >= 198) & (i[0] <= 228) & ~(i[1] >= 140):
        file.write("Program: BLDG
\r\n===== \r\n"

"===== \r\n") #
done
    if (i[0] >= 237) & (i[0] <= 277) & ~(i[1] >= 140):
        file.write("Program: CESS
\r\n===== \r\n"

"===== \r\n") #
done
    if (i[0] >= 275) & (i[0] <= 305) & ~(i[1] >= 140):
        file.write("Program: ERGY
\r\n===== \r\n"

```

```

"===== \r\n" #
done
    if (i[0] >= 307) & (i[0] <= 337) & ~(i[1] >= 140):
        file.write("Program: COMM
\r\n===== \r\n"

"===== \r\n" #
done
    if (i[0] >= 354) & (i[0] <= 384) & ~(i[1] >= 140):
        file.write("Program: MANF
\r\n===== \r\n"

"===== \r\n" #
done
    if (i[0] >= 120) & (i[0] <= 150) & (i[1] >= 140):
        file.write("Program: LAAR
\r\n===== \r\n"

"===== \r\n" #
done
    if (i[0] >= 159) & (i[0] <= 189) & (i[1] >= 140):
        file.write("Program: MATL
\r\n===== \r\n"

"===== \r\n" #
done
    if (i[0] >= 198) & (i[0] <= 228) & (i[1] >= 140):
        file.write("Program: CISE
\r\n===== \r\n"

"===== \r\n" #
done
    if (i[0] >= 237) & (i[0] <= 277) & (i[1] >= 140):
        file.write("Program: HAUD
\r\n===== \r\n"

"===== \r\n" #
done
    while (j != 19) & (i[1] >= answers[3][1]):
        if i[1] == answers[j+3][1]:
            # Questions
            if (i[0] >= 310) & (i[0] <= 340):
                file.write("Question"+Question_no[j] + " : Strongly Agree
\r\n===== \r\n")
                j += 1
                break
            if (i[0] >= 341) & (i[0] <= 371):
                file.write("Question"+Question_no[j] + " : Agree
\r\n===== \r\n")
                j += 1
                break
            if (i[0] >= 372) & (i[0] <= 402):
                file.write("Question"+Question_no[j] + " : Neutral
\r\n===== \r\n")

```

```
        j += 1
        break
    if (i[0] >= 403) & (i[0] <= 433):
        file.write("Question"+Question_no[j] + " : Disagree
\r\n===== \r\n")
        j += 1
        break
    if (i[0] >= 434) & (i[0] <= 474):
        file.write("Question"+Question_no[j] + " : Strongly Disagree
\r\n===== \r\n")
        j += 1
        break
file.close()
cv2.waitKey(0)
cv2.destroyAllWindows()
```

Steps to reach the output :


1. Input image from the user.
2. After reading the input image , first resizing the image to make sure that any image has the same size so as the algorithm will work on any image size
3. Then checking if the image is rotated and detect the angle of rotation and the direction of rotation by calculating the slope
4. After rotating the image , thresholding is applied to remove any un-wanted data and focus on the needed features only
5. Finally assigning ranges for each question on the X-AXIS and Y-AXIS to be able to know the answer
6. Check if any question has 2 answers and then reject the paper

Github repository: <https://github.com/AndrewSameh1998/ocr.git>






## Test Cases 1 :



**AIN SHAMS UNIVERSITY**  
I-Credit Hours Engineering Programs  
(i.CHEP)



**University of East London**

### End-Course/Module Evaluation

Course Code:

Semester: ☐ Fall ☐ Spring ☐ Summer

Program: ☐ MCTA ☐ ENVER ☐ BLDG ☐ CESS ☒ ERGY ☐ COMM ☐ MANF  
☐ LAAR ☐ MATL ☐ CISE ☐ HAUD

Course Name:

Gender: ☐ Male ☒ Female

Mark as shown: ☒ CORRECT ☐ INCORRECT

Please use a ball-point pen or a thin felt tip. This form will be processed automatically.  
 Please follow the examples shown on the left hand side to help optimize the reading results.

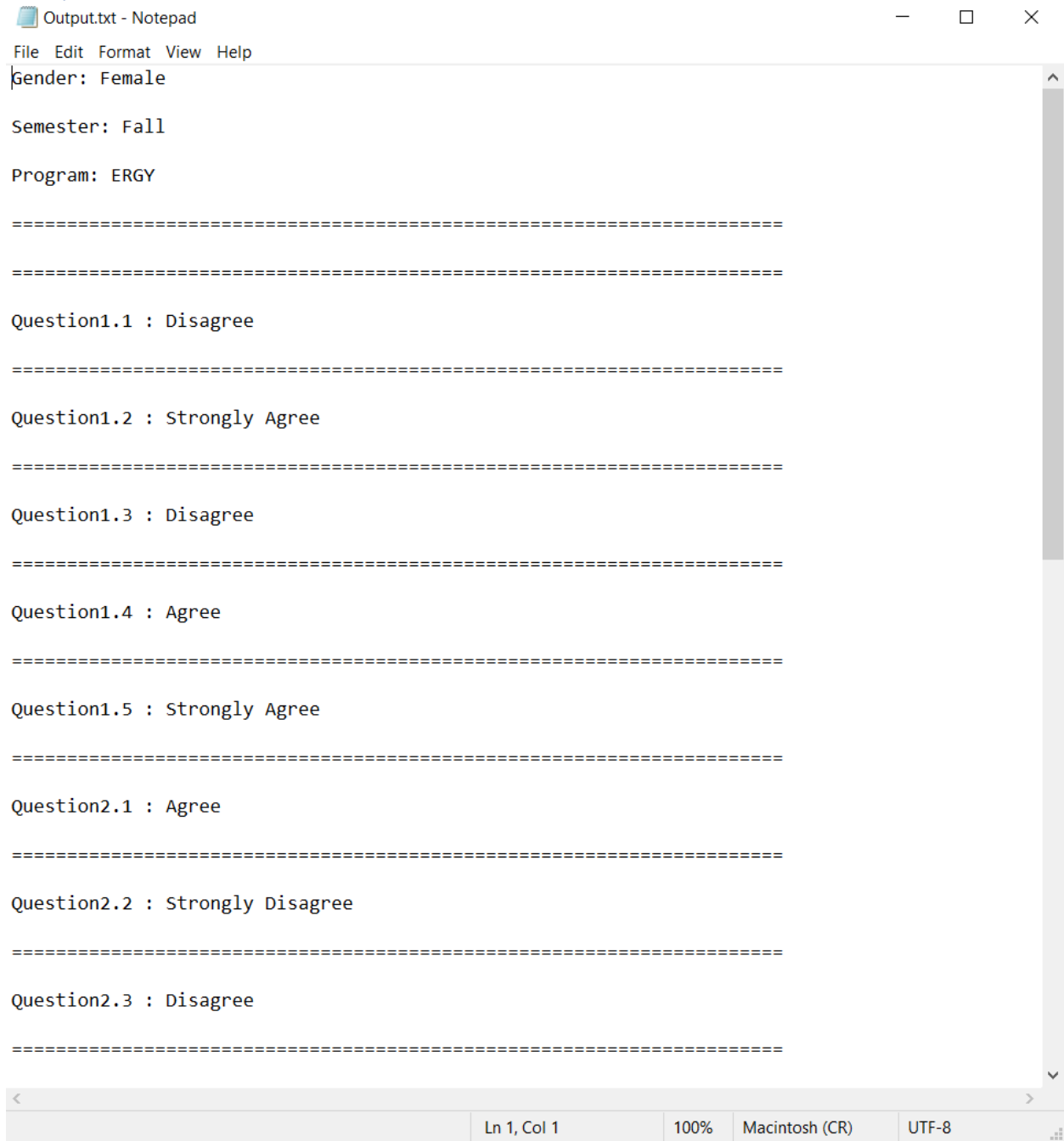
It is important to us to get feedback from you about this course/module. The results of the survey are anonymised and individual comments are not identified, so please take the time to answer all the questions as fully as you can. Your feedback will be used to review this course/module and to plan for the future.  
 Please select one box for each question that best reflects your opinion.  
 Please do not identify any individuals (including staff names) in your comments.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
<b>1. Teaching Sessions</b>					
1.1 The teaching on this course/module is intellectually stimulating.	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input checked="" type="radio"/> 4	<input type="radio"/> 5
1.2 Matters are explained well in the teaching sessions.	<input checked="" type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5
1.3 The teaching methods used helped me to learn.	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input checked="" type="radio"/> 4	<input type="radio"/> 5
1.4 Lecturers were good at explaining things.	<input type="radio"/> 1	<input checked="" type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5
1.5 The course/module was academically challenging.	<input checked="" type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5
<b>2. Course/Module Support</b>					
2.1 I am aware of the course/module learning outcomes.	<input type="radio"/> 1	<input checked="" type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5
2.2 The assessment requirements were clear.	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input checked="" type="radio"/> 5
2.3 I feel well supported on this course/module.	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input checked="" type="radio"/> 4	<input type="radio"/> 5
2.4 Feedback on summative work was provided within the time specified	<input type="radio"/> 1	<input checked="" type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5
2.5 The workload for this course/module is manageable.	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input checked="" type="radio"/> 4	<input type="radio"/> 5
2.6 The assessments completed so far stimulated my learning.	<input type="radio"/> 1	<input checked="" type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5
<b>3. Course/Module Organization</b>					
3.1 The course/module was well organized and ran smoothly.	<input type="radio"/> 1	<input checked="" type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5
3.2 The course/module focused on what was set out in the student guide.	<input checked="" type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5
3.3 I have been able to contact staff when I needed to.	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input checked="" type="radio"/> 4	<input type="radio"/> 5
<b>4. Course/Module Resources</b>					
4.1 The course/module materials on Moodle are helpful in supporting my learning.	<input type="radio"/> 1	<input type="radio"/> 2	<input checked="" type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5
4.2 The library resources for the course/module, including its digital resources, meet my needs.	<input checked="" type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5
4.3 I am satisfied with the quality of classroom facilities for this course/module.	<input type="radio"/> 1	<input type="radio"/> 2	<input checked="" type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5
<b>5. Course/Module Satisfaction</b>					
5.1 Overall, I was satisfied with my experience of this course/module.	<input checked="" type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5
5.2 I would recommend this course/module to another student	<input type="radio"/> 1	<input type="radio"/> 2	<input checked="" type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5

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Figure 1 Test Sample 1

## Output for testcase 1:



```
Output.txt - Notepad
File Edit Format View Help
Gender: Female

Semester: Fall

Program: ERGY

=====

=====

Question1.1 : Disagree

=====

Question1.2 : Strongly Agree

=====

Question1.3 : Disagree

=====

Question1.4 : Agree

=====

Question1.5 : Strongly Agree

=====

Question2.1 : Agree

=====

Question2.2 : Strongly Disagree

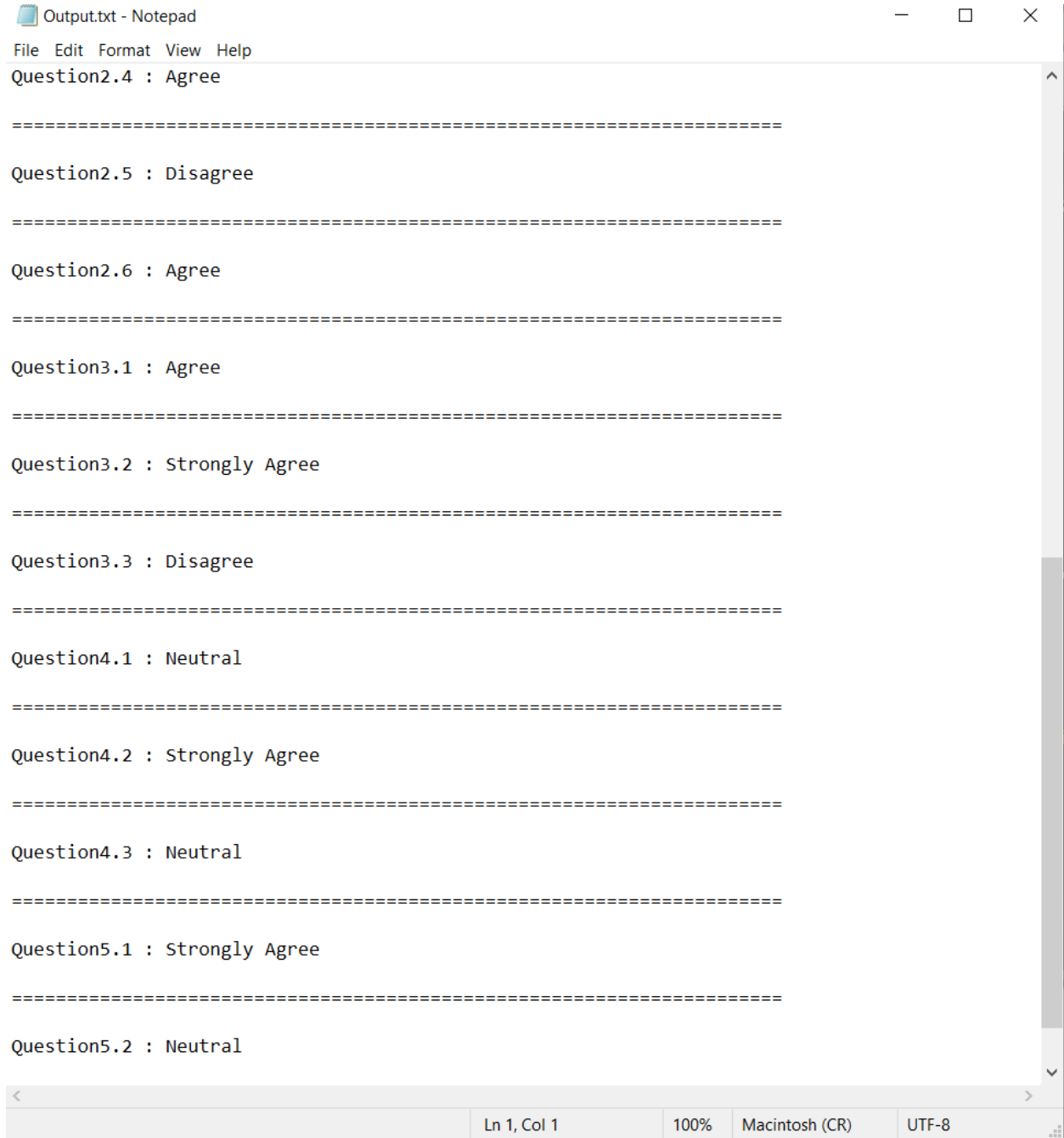
=====

Question2.3 : Disagree

=====

< Ln 1, Col 1 100% Macintosh (CR) UTF-8 >
```

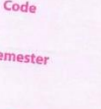
Figure 2 Test Case 1 Output File




```
Output.txt - Notepad
File Edit Format View Help
Question2.4 : Agree
=====
Question2.5 : Disagree
=====
Question2.6 : Agree
=====
Question3.1 : Agree
=====
Question3.2 : Strongly Agree
=====
Question3.3 : Disagree
=====
Question4.1 : Neutral
=====
Question4.2 : Strongly Agree
=====
Question4.3 : Neutral
=====
Question5.1 : Strongly Agree
=====
Question5.2 : Neutral
=====
Ln 1, Col 1 100% Macintosh (CR) UTF-8
```

Figure 3 Test Case 1 Output File (Cont.)

## Test Case 2 :



**AIN SHAMS UNIVERSITY**  
I-Credit Hours Engineering Programs  
(i.CHEP)



**University of East London**

## End-Course/Module Evaluation

**Course Code**

**Semester**

**Program**

**Course Name**

**Gender** ☐ Male ☐ Female

**1** MCTA **2** ENVR **3** BLDG **4** CESS **5** ERGY **6** COMM **7** MANF  
**8** LAAR **9** MATL **10** CISE **11** HAUD

**Mark as shown:** ☒ CORRECT ☐ INCORRECT

Please use a ball-point pen or a thin felt tip. This form will be processed automatically.  
Please follow the examples shown on the left hand side to help optimize the reading results.

It is important to us to get feedback from you about this course/module. The results of the survey are anonymised and individual comments are not identified, so please take the time to answer all the questions as fully as you can. Your feedback will be used to review this course/module and to plan for the future.  
Please select one box for each question that best reflects your opinion.  
Please do not identify any individuals (including staff names) in your comments.

### 1. Teaching Sessions

1.1 The teaching on this course/module is intellectually stimulating.

1.2 Matters are explained well in the teaching sessions.

1.3 The teaching methods used helped me to learn.

1.4 Lecturers were good at explaining things.

1.5 The course/module was academically challenging.

### 2. Course/Module Support

2.1 I am aware of the course/module learning outcomes.

2.2 The assessment requirements were clear.

2.3 I feel well supported on this course/module.

2.4 Feedback on summative work was provided within the time specified

2.5 The workload for this course/module is manageable.

2.6 The assessments completed so far stimulated my learning.

### 3. Course/Module Organization

3.1 The course/module was well organized and ran smoothly.

3.2 The course/module focused on what was set out in the student guide.

3.3 I have been able to contact staff when I needed to.

### 4. Course/Module Resources

4.1 The course/module materials on Moodle are helpful in supporting my learning.

4.2 The library resources for the course/module, including its digital resources, meet my needs.

4.3 I am satisfied with the quality of classroom facilities for this course/module.

### 5. Course/Module Satisfaction

5.1 Overall, I was satisfied with my experience of this course/module.

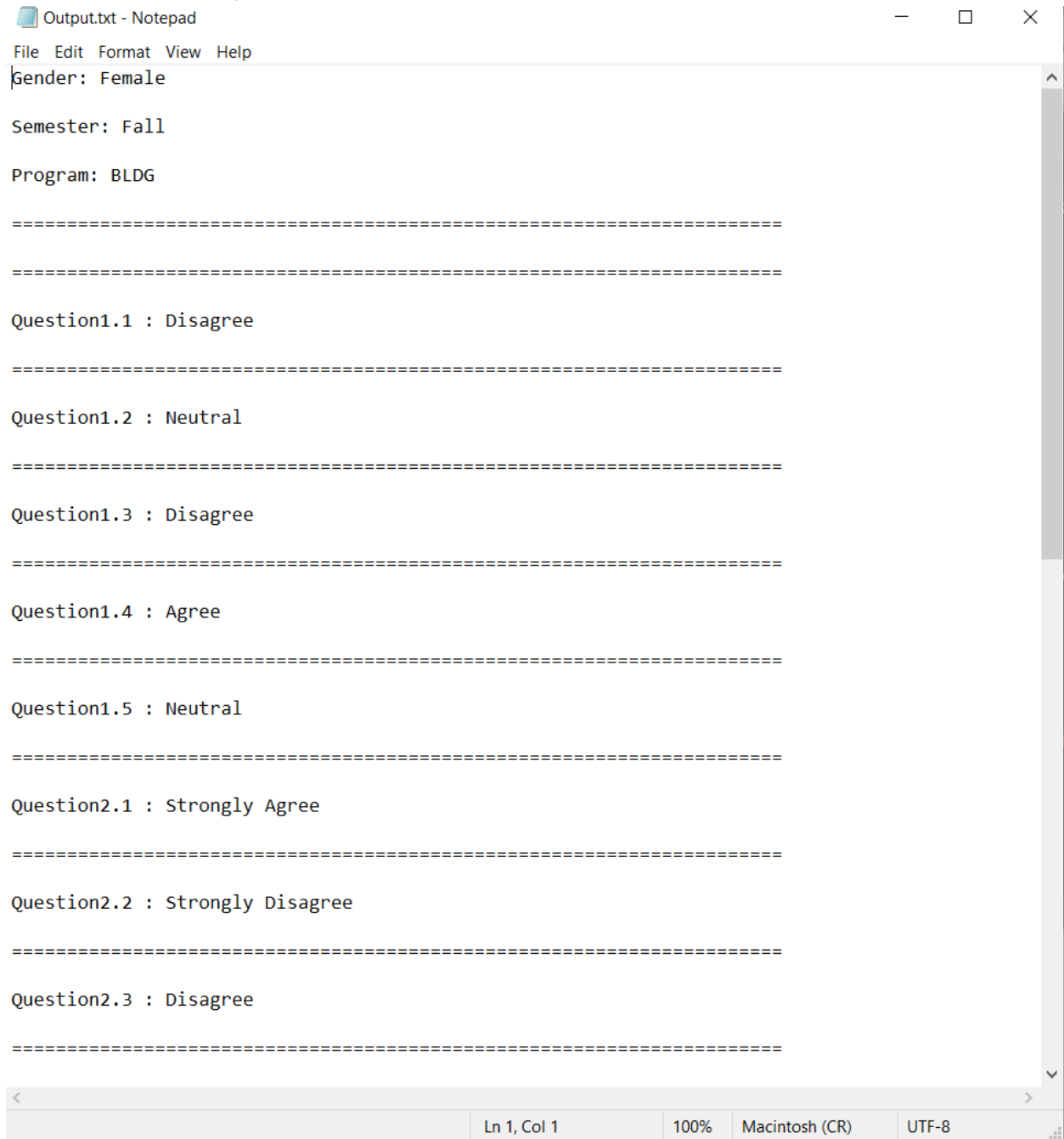
5.2 I would recommend this course/module to another student

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	2	3	4	5
1	2	3	4	5
1	2	3	4	5
1	2	3	4	5
1	2	3	4	5
1	2	3	4	5
1	2	3	4	5
1	2	3	4	5
1	2	3	4	5
1	2	3	4	5
1	2	3	4	5
1	2	3	4	5
1	2	3	4	5
1	2	3	4	5
1	2	3	4	5
1	2	3	4	5

Page 1 of 2

Figure 4 Test Sample 2

## Test Case 2 Output :



```
Output.txt - Notepad
File Edit Format View Help
Gender: Female

Semester: Fall

Program: BLDG

=====

=====

Question1.1 : Disagree

=====

Question1.2 : Neutral

=====

Question1.3 : Disagree

=====

Question1.4 : Agree

=====

Question1.5 : Neutral

=====

Question2.1 : Strongly Agree

=====

Question2.2 : Strongly Disagree

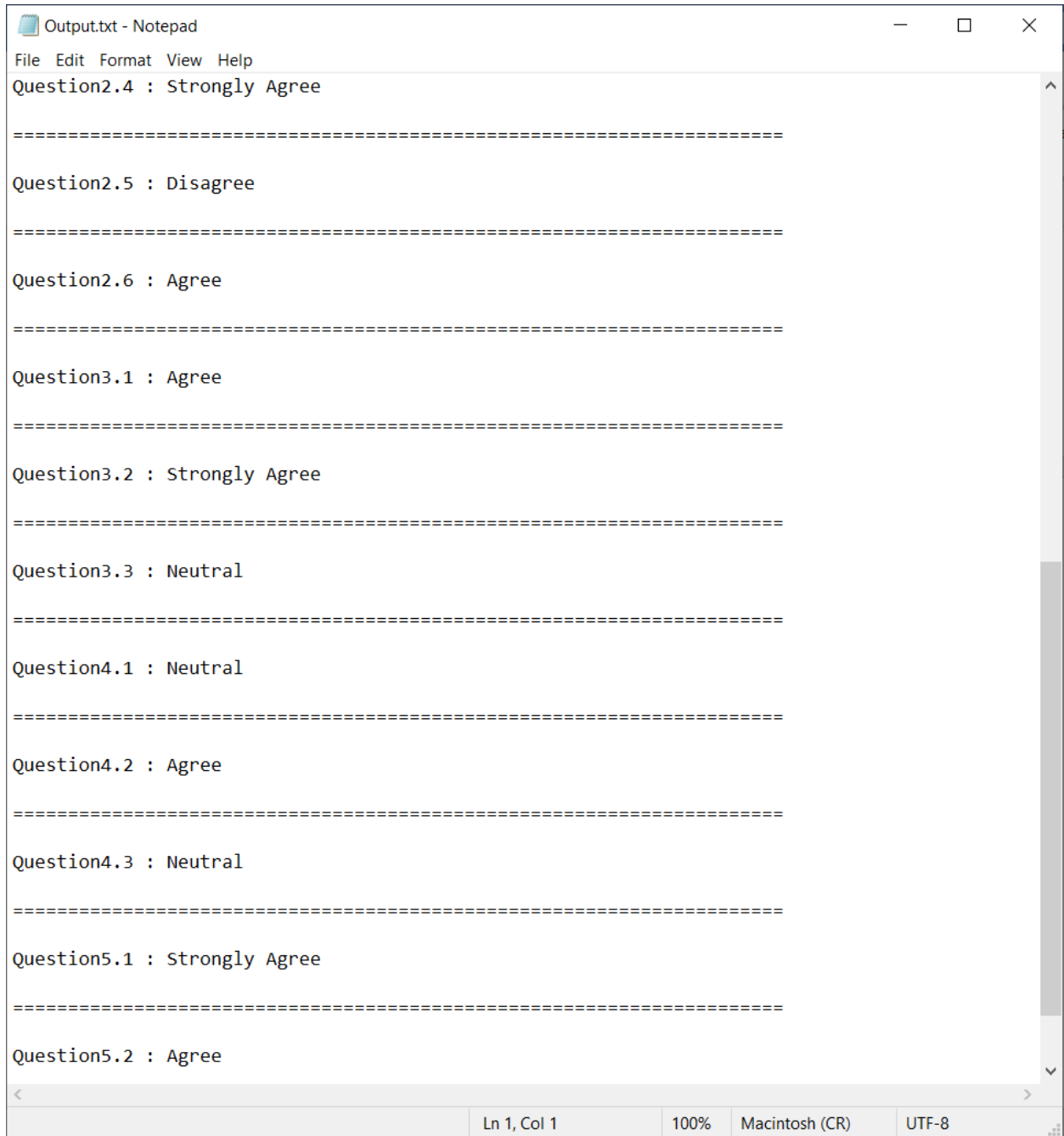
=====

Question2.3 : Disagree

=====

< Ln 1, Col 1 100% Macintosh (CR) UTF-8 >
```

Figure 5 Test Case 2 Output File




```
Output.txt - Notepad
File Edit Format View Help
Question2.4 : Strongly Agree
=====
Question2.5 : Disagree
=====
Question2.6 : Agree
=====
Question3.1 : Agree
=====
Question3.2 : Strongly Agree
=====
Question3.3 : Neutral
=====
Question4.1 : Neutral
=====
Question4.2 : Agree
=====
Question4.3 : Neutral
=====
Question5.1 : Strongly Agree
=====
Question5.2 : Agree
=====
Ln 1, Col 1 100% Macintosh (CR) UTF-8
```


Figure 6 Test Case 2 Output File (Cont.)



## Test Case 3 :



**AIN SHAMS UNIVERSITY**  
I-Credit Hours Engineering Programs  
(i.CHEP)



**University of  
East London**

### End-Course/Module Evaluation

Course Code:

Semester:

Program:

Course Name:

Gender: ☒ Male ☐ Female

☐ Fall ☒ Spring ☐ Summer

☐ MCTA ☐ ENVER ☐ BLDG ☐ CESS ☐ ERGY ☒ COMM ☐ MANF  
☐ LAAR ☐ MATL ☐ CISE ☐ HAUD

Mark as shown:

☒ CORRECT

☒ INCORRECT

Please use a ball-point pen or a thin felt tip. This form will be processed automatically.

Please follow the examples shown on the left hand side to help optimize the reading results.

It is important to us to get feedback from you about this course/module. The results of the survey are anonymised and individual comments are not identified, so please take the time to answer all the questions as fully as you can. Your feedback will be used to review this course/module and to plan for the future.

Please select one box for each question that best reflects your opinion.

Please do not identify any individuals (including staff names) in your comments.

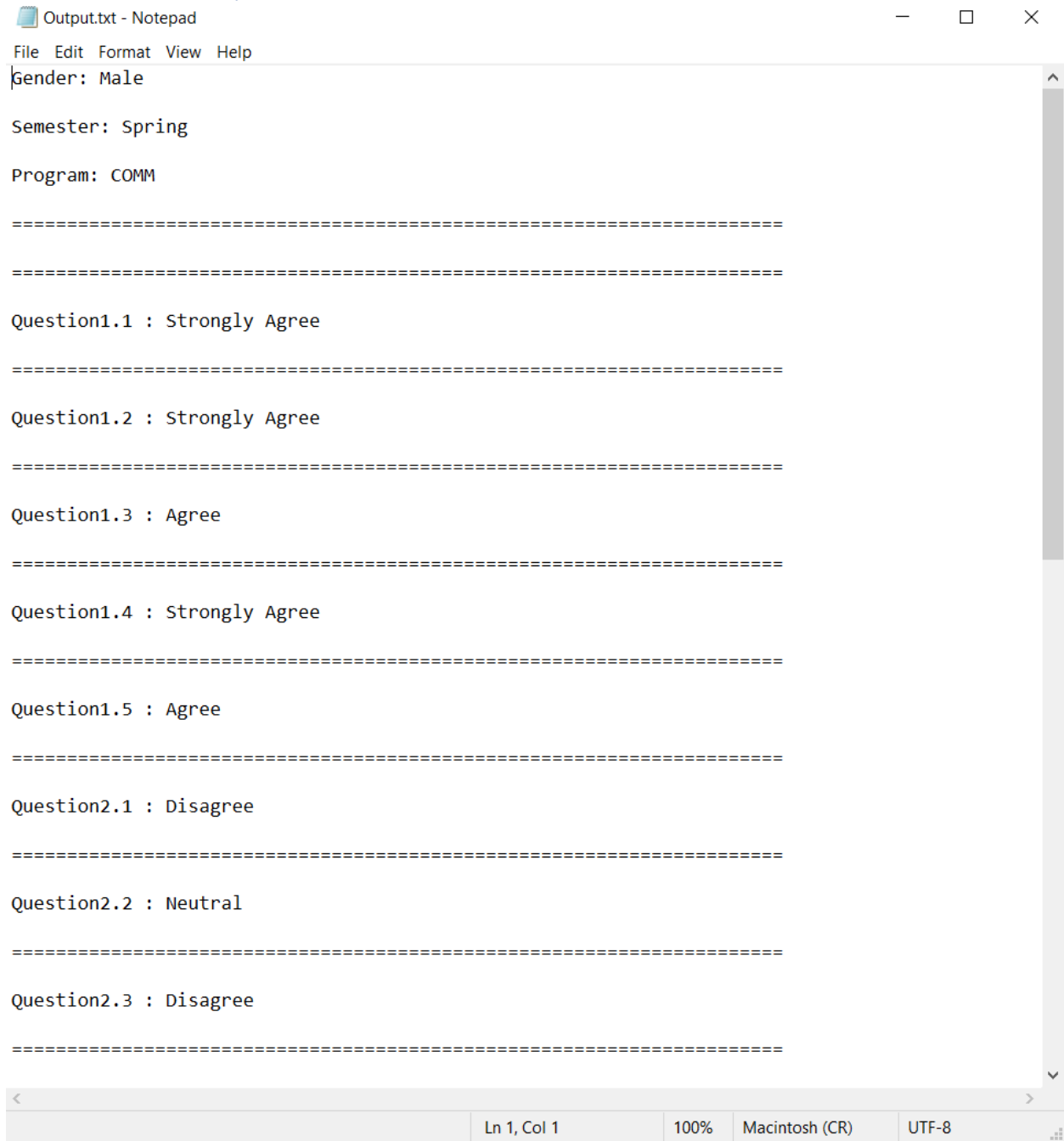
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
<b>1. Teaching Sessions</b>					
1.1 The teaching on this course/module is intellectually stimulating.	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1.2 Matters are explained well in the teaching sessions.	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1.3 The teaching methods used helped me to learn.	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1.4 Lecturers were good at explaining things.	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1.5 The course/module was academically challenging.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>2. Course/Module Support</b>					
2.1 I am aware of the course/module learning outcomes.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
2.2 The assessment requirements were clear.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
2.3 I feel well supported on this course/module.	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
2.4 Feedback on summative work was provided within the time specified	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2.5 The workload for this course/module is manageable.	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2.6 The assessments completed so far stimulated my learning.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>3. Course/Module Organization</b>					
3.1 The course/module was well organized and ran smoothly.	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
3.2 The course/module focused on what was set out in the student guide.	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
3.3 I have been able to contact staff when I needed to.	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>4. Course/Module Resources</b>					
4.1 The course/module materials on Moodle are helpful in supporting my learning.	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4.2 The library resources for the course/module, including its digital resources, meet my needs.	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4.3 I am satisfied with the quality of classroom facilities for this course/module.	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>5. Course/Module Satisfaction</b>					
5.1 Overall, I was satisfied with my experience of this course/module.	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5.2 I would recommend this course/module to another student	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Page 1 of 2

Figure 7 Test Sample 3



## Test Case 3 Output :



```
Output.txt - Notepad
File Edit Format View Help
Gender: Male

Semester: Spring

Program: COMM

=====

=====

Question1.1 : Strongly Agree

=====

Question1.2 : Strongly Agree

=====

Question1.3 : Agree

=====

Question1.4 : Strongly Agree

=====

Question1.5 : Agree

=====

Question2.1 : Disagree

=====

Question2.2 : Neutral

=====

Question2.3 : Disagree

=====

Ln 1, Col 1 100% Macintosh (CR) UTF-8
```

Figure 8 Test Case 3 Output File

```
Output.txt - Notepad
File Edit Format View Help
Question2.4 : Neutral
=====
Question2.5 : Agree
=====
Question2.6 : Agree
=====
Question3.1 : Neutral
=====
Question3.2 : Neutral
=====
Question3.3 : Neutral
=====
Question4.1 : Agree
=====
Question4.2 : Neutral
=====
Question4.3 : Agree
=====
Question5.1 : Neutral
=====
Question5.2 : Strongly Agree
=====
Ln 1, Col 1 100% Macintosh (CR) UTF-8
```

Figure 9 Test Case 3 Output File (Cont.)