Department of Computer Science and Engineering

University of Asia Pacific (UAP)

Program: B.Sc. in Computer Science and Engineering

Final Examination | **Spring 2020** | **3rd Year, 1st Semester**

Course Code: CSE 303 | **Course Title: Data Communication** | **Credits: 3.00**

Full Marks: 120* (Written) | **Duration: 2 Hours**

* Total Marks of Final Examination: 150 (Written: 120 + Viva: 30)

Instructions:

1. There are **Four (4)** Questions. Answer all of them. All questions are of equal value. Partial marks are shown in the margins.
2. Non-programmable calculators are allowed.

1. **a)** Say, we have three rooms each having 3 PCs in a room, total of 9 PCs. Now draw a hybrid topology where you will use any one kind of topology to connect the three PCs in each room and another kind of topology (as a backbone topology) to connect the three rooms. [8]

b) What are the four levels of addresses in TCP/IP protocol? Write the significance of these four addresses and mention the corresponding layer name where they are dealt with. [4 x 3 = 12]

c) Suppose, we have a periodic composite signal shown in Fig: 1.1 which is a combination of three sine waves. The sine waves have the following properties. [10]

Sine wave No.	Amplitude (Unit)	Frequency (Hz)
1.	0.5	6
2.	1	3
3.	2	1

The signal in Fig 1.1 is drawn in time domain. Draw the signal in frequency domain.

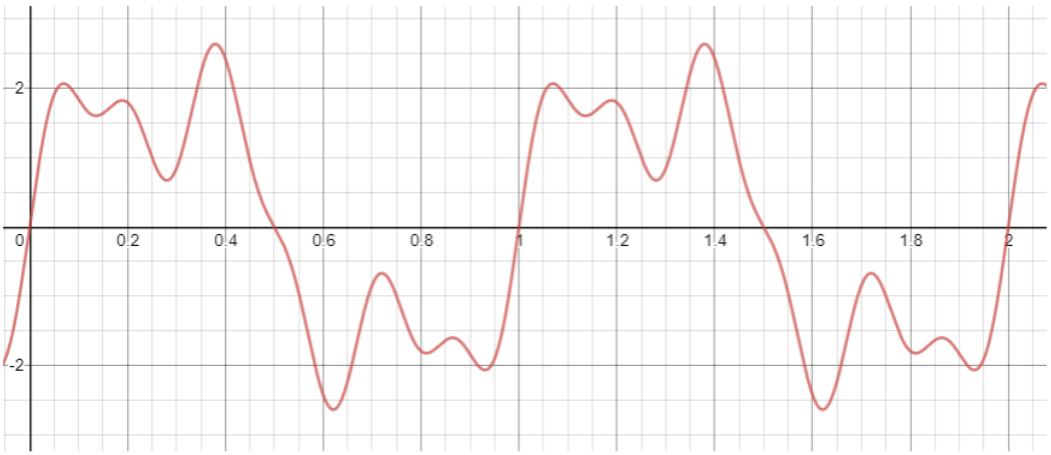

Fig: 1.1

2. **a)** Compare between Serial Communication and Parallel Communication. [5]

b) Explain how the Bipolar Scheme handles the following concerns – [2 x 5 = 10]

a) Self-synchronization

b) DC component

c) You have to send a data packet ***X*** of 12 bits to your friend using 4B/5B block coding. [15]

Here ***X*** is the least significant 12 bits of the binary representation of your student ID number.

If your student ID is 14101142, the binary representation will be

110101110010101010010110

Taking the right most 12 bits, we have ***X*** = **101010010110**

* Note: you can get the binary representation of your student ID easily by searching **"14101142 in binary"** in google search bar.

4B/5B mapping codes are given below:

Data Sequence	*Encoded Sequence*
0000	11110
0001	01001
0010	10100
0011	10101
0100	01010
0101	01011
0110	01110
0111	01111

Data Sequence	*Encoded Sequence*
1000	10010
1001	10011
1010	10110
1011	10111
1100	11010
1101	11011
1110	11100
1111	11101

What will be the encoded sequence of bits you will send to your friend?

3. Read the following description and answer question no. 3(a) and 3(b).

Suppose, you have to send a data packet ***X*** of 10 bits to your friend.

Here ***X*** is the least significant 10 bits of the binary representation of your student ID number.

If your student ID is 14101142, the binary representation will be

110101110010101010010110

Taking the right most 10 bits, we have ***X*** = **1010010110**

* Note: you can get the binary representation of your student ID easily by searching **"14101142 in binary"** in google search bar.

a) Say, you are using binary FSK for converting digital data ***X*** to a modulated analog signal. Now draw the modulated signal mentioning in your bit to frequency mapping. [10]

b) If you were using Quadrature PSK to convert your digital data ***X*** to the analog signal. Examine the shape of your modulated signal by mentioning the assumptions of bit to phase mapping. [10]
(You do not have to describe the entire method. Only the bit to phase mapping and the modulated signal)

c) Suppose in multilevel FSK, we need to send ***Y*** bits data at a time. Here, baud rate is 6 Mbaud. The carrier frequency is 50 MHz. Calculate the number of levels (different frequencies), the bit rate, and the bandwidth. [10]

Here, ***Y*** = (last digit of your student ID mod 4) +1

If your student ID is 1410114**0**, ***Y*** = (**0** mod 4) + 1 = 1

4. **a)** Suppose three friends Joey, Chandler and Ross are thinking about opening a Telephone company like the American company AT&T. They are planning to implement **FDM** for their multiplexing procedure. They know that each voice channel requires 4 KHz of bandwidth. They thought of combining **P** voice channels at the first stage to create a **Group**, then joining **Q** Groups together to form a **Super-group**. These **P** Groups are separated by guard bands of 50Hz each. In the third step, 12 Super-groups are combined to form a **Master-group**. In this stage, a total of 0.12MHz is used as guard band. Finally, 6 Master-groups are connected together to form a **Jumbo-group**. Now after multiplexing, find out the total bandwidth requirement for the telephone company. [15]

For the value of **P** and **Q** use your date of birth. Suppose, your date of birth is written in this format: ***P-Q-Y***. For example, my date of birth is 17-08-1992 (DD-MM-YYYY). So here, ***P***=17, ***Q***=8, ***Y***=1992.

b) The seven avengers Iron man, Captain America, Black widow, Hulk, Thor, Doctor Strange and Black Panther are on a mission to save the world. They are communicating using 7 channels. [6 + 6 + 3]

Channel 1 (Iron Man) : WHAT?
Channel 2 (Captain America): HELLO
Channel 3 (Black widow) : HEY!
Channel 4 (Hulk) : GRRR!
Channel 5 (Thor) : WELCOME
Channel 6 (Doctor Strange) : BYE

Channel 7 (Black Panther) : WAKANDA

Here you have to work with channel ***X*** , ***Y*** & ***Z*** where,
X = (last digit of your student ID mod 7) +1
Y = (second last digit of your student ID mod 7) +1
Z = (third last digit of your student ID mod 7) +1

(If you get same value for ***X***, ***Y*** or ***Z*** use that channel multiple times)

i) Create the contents of the output frames for a synchronous TDM multiplexer that combines these sources ***X***, ***Y*** & ***Z*** sending the characters having the unit size of one character. Remember to use synchronization bit for each of the frame.
ii) In statistical TDM, construct the contents of the output frames for the channels ***X***, ***Y*** & ***Z***. Remember to add the source addresses (channel no.) in each frame.
iii) Analyze the significance of the source addresses in statistical TDM.

Or,

4. **a)** Suppose three friends Barney, Ted and Marshall are thinking about opening a Telephone company that uses **TDM** for their multiplexing procedure. The Digital Signal (DS-0) lines in TDM needs 64 kbps individually. There will be total ***P*** DS-0 lines in the first stage. In the second stage DS-1, they are planning to add ***Q*** lines each having ***P*** number of DS-0 lines with a total of 8kbps overhead. Again, in third stage DS-2, there will be 96 DS-1 lines with a total of 168kbps overhead. Now after multiplexing, find out the total bandwidth requirement for the telephone company. [12]

For the value of ***P*** and ***Q*** use your date of birth. Suppose, your date of birth is written in this format: ***P-Q-Y***. For example, my date of birth is 17-08-1992 (DD-MM-YYYY). So here, ***P***=17, ***Q***=8, ***Y***=1992.

b) Total ***Z*** channels, from which ***X*** channels with a bit rate of 200 kbps and ***Y*** channels with a bit rate of 150 kbps, are to be multiplexed using multiple slot TDM. A unit size is 1 bit. [10]

Here, ***Z= X+Y***
X= Last digit of your student ID +1
Y= Second Last digit of your student ID+2

Answer the following questions:
a. What is the size of a frame in bits?
b. What is the frame rate?
c. What is the duration of a frame?
d. What is the data rate of the link?
e. What is the duration of a bit in the link?

c) The Fig 4.1 shows a demultiplexer of a TDM. If the frame size is 16 bits long (no synchronous / frame bits), what is the bit stream in each output? The bits arrive at the demultiplexer as shown by the arrow. [8]

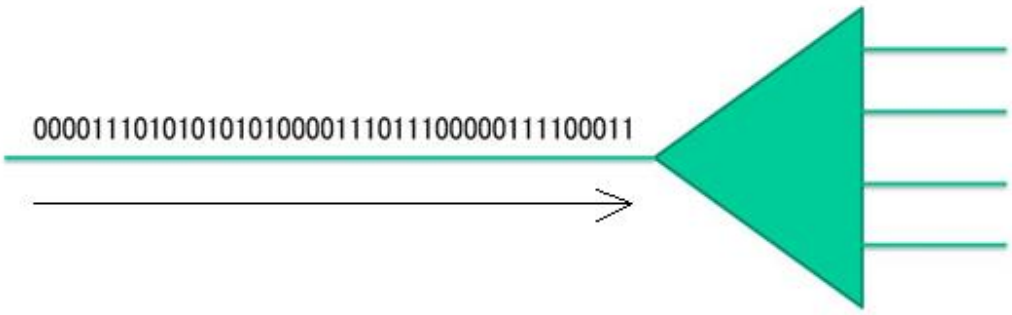

Fig: 4.1

Department of Computer Science & Engineering

University of Asia Pacific (UAP)

Program: B.Sc. in Computer Science and Engineering

Final Examination	**Spring 2020**	**3rd Year 1st Semester**
Course Code: CSE 305	**Course Title: System analysis and design**	**Credits: 3**
Full Marks: 120* (Written)		**Duration: 2 Hours**

* Total Marks of Final Examination: 150 (Written: 120 + Viva: 30)

Instructions:

1. There are **Four (4)** Questions. Answer all of them. All questions are of equal value. Part marks are shown in the margins.
2. Non-programmable calculators are allowed.

1. You need to design an online exam system. There will be account for teachers and students and they both needs to login and register. Teacher can schedule an exam and set questions. Question can be of three types: mcq, short question, and broad question. Students can either type the answers or write in paper and upload the image. There will be invigilators at the time of exam. Invigilator will monitor the exam using video, and audio surveillance. Teacher can also return grades to the students using the system. **Draw the use case diagram of the online exam system.** 30

OR

Consider an ecommerce site for electronic goods. The site sells mobile, laptop, and accessories. For each item system stores its price, brand name, tag, arrival date, and other information. Customer can search and add items to cart. When customer checks out each item in the cart is processed and total price is calculated. Customer provided the billing and shipping info and place the order. System stores name, email address and other necessary information for each customer. Each customer has an account history where he can see his previous purchases and pending orders. **Draw the class diagram of the ecommerce site**. You need to show the class attributes with their visibility and relationship between classes. 30

2. You need to design a library management system. There will be account for librarians and students. Librarians can grant membership to the students. Students need to login to view the book list. Students can search for books and order books. If the books are available students will send a request, and librarians will accept the request and lend the book. Database will be updated accordingly. Librarians can also manage students accounts. Students can see his account history, pending return books, and pending payments. **Draw the dataflow diagram of the library management system.** 30

3. Consider the library management system of question 2. You need to design the use case "order books". First, a student will login and selects desired books. The student can also search for a specific keyword. System will show a list of matching books and student will select the desired ones. For each selected book, system will check if the book is available, or waiting for return from other students. If a book is available system will add it to granted list. If a book is waiting for return from other students, system will add it to waiting list and specify the approximate return date. Then system will show the granted and waiting list to the student. Finally, if the student confirms the order, librarian will lend the books of granted list to the student. **Draw the sequence diagram of the "order book" use case.** 30

4. Suppose you are scheduling a project. You have broken down your project into 10 tasks. The number of days required to complete each task and dependencies among them are given bellow. 30

Task	Required number of days	Dependencies
T1	5	
T2	10	T1
T3	5	T1
T4	10	
T5	10	T1, T3
T6	10	T2, T3
T7	10	T6
T8	10	T3, T5
T9	20	T6
T10	5	T9

Assume you have enough employees, and you can schedule tasks parallelly if there are no dependencies among them. **Draw an activity bar chart of your project schedule and determine the minimum number of days to complete the project**.

Department of Computer Science & Engineering

University of Asia Pacific (UAP)

Program: B.Sc. in Computer Science and Engineering

Final Examination	**Spring 2020**	**3rd Year 1st Semester**
Course Code: CSE 307	**Course Title: Theory of Computation**	**Credits: 3**
Full Marks: 120* (Written)		**Duration: 2 Hours**

* Total Marks of Final Examination: 150 (Written: 120 + Viva: 30)

Instructions:

1. There are **Four (4)** Questions. Answer all of them. All questions are of equal value. Part marks are shown in the margins.
2. Non-programmable calculators are allowed.
3. ***Use your own name, id in the answer script whenever required as instructed in the classroom.***

1. **a)** Let, my name is *nadeem ahmed*. The first letter of first and last names are: n and a. 15

Design a Turing Machine for the following expression:

$L = n^n a^{2n}$ where $n>0$

b) Suppose, my name is *nadeem ahmed*. The first letter of last name is: n. Then length of my last name is: 5 which is an **odd number**. (it might be even number in your case, then you have to design for even number) 15

Design a Turing Machine for the following expression:

$L = a^n$, **here superscript n is 1,3,5,7, … … odd number.**

2. **a)** If my name is **a**bul **b**ashar. (Take first two letters of both first and last names). 12 + 12

Design Pushdown Automata (PDA) that recognizes

i) $\{a^n b^n \mid n>0\}$

ii) $\{w \in \{0, 1\}^* \mid w$ contains at least **(the length of your first name)** 1's $\}$

b) 6

Let $\sum$ = {the letters/symbols of your own name}

Suppose you want to construct the following language:

"The set of all strings that either start with *your first name* or *last name*."

i) Write a regular expression for this language.

ii) Draw a corresponding NFA.

3. **a)** If my name is **<u>S</u>hah <u>A</u>bu <u>B</u>akar**. 24

Begin with the grammar: $S \rightarrow ASA \mid aB$ $A \rightarrow B \mid S$ $B \rightarrow b \mid \epsilon$	Begin with the grammar: (fn cl) → (mn cl)(fn cl)(mn cl) | (mn sl)(ln cl) (mn cl) → (ln cl) | (fn cl) (ln cl) → (ln sl) | ϵ fn = first name, mn = middle name, ln = last name cl = capital letter, sl = small letter

i) Eliminate ϵ-productions.
ii) Eliminate any unit productions in the resulting grammar.
iii) Eliminate any useless symbols in the resulting grammar.
iv) Put the resulting grammar into Chomsky Normal Form.

b) Suppose, my name is *nadeem ahmed*. The first letter of first and last names are: <u>n</u> and <u>a</u>. 6

Write a context-free grammar for the following languages:
$L = n^n a^{2n}$

4. **a)** 15

Let ∑ = {the letters/symbols of your own name}

Suppose you want to construct the following language:

"The set of all strings that accept any string of *your first name length* <u>but will not accept your name as a string</u>."

Draw a corresponding NFA.

b) What is the purpose of the *pumping lemma* in case of regular language? Use the *pumping lemma* to show that $\{a^p b^q c^r \mid n>0\}$ is not regular. Here p, q, r is the respective length of your own first, middle and last name. 15

OR

a) Suppose, my id is 14101010. First two digits (14) stand for admission year 2014, then next digit (1) stand for Spring semester (i.e. 2 stands for Fall semester), then 01 which stands CSE department (0x indicates another department), and last three digits (010) stands for my class roll. 15

Now, write your own id and then write a regular expression for all the id(s) of your class. Please note:

- Year is same as your current admission year including last two previous years (i.e. in this scenario admission years are: 2014, 2013, 2012).
- It includes **only the semester** where you belong.
- The range of class roll is 001 to 999. **But** 005, 015, 025 … 995 cannot belong to this group. These class roll numbers have different purpose and cannot be used as student id(s).

b) What is the purpose of the *pumping lemma* in case of regular language? Use the *pumping lemma* to show that $\{0^n \mid n \text{ is the multiple of your first name length}\}$ is not regular. 15

Department of Computer Science & Engineering

University of Asia Pacific (UAP)

Program: B.Sc. in Computer Science and Engineering

Final Examination	**Spring 2020**	**3rd Year 1st Semester**
Course Code: CSE 309	**Course Title: Object Oriented Programming II: Visual and Web Programming**	**Credits: 3**
Full Marks: 120* (Written)		**Duration: 2 Hours**

* Total Marks of Final Examination: 150 (Written: 120 + Viva: 30)

Instructions:

1. There are **Four (4)** Questions. Answer all of them. All questions are of equal value. Part marks are shown in the margins.
2. Non-programmable calculators are allowed.

1. a) Suppose, one of your team members has written the "Product" model in the models.py file as following

```
class Product(models.Model):
    name = models.CharField(max_length=100)
    price = models.IntegerField(blank=True)
    category = models.CharField(max_length=100)
    description = models.TextField(blank=True)

    image = models.ImageField(upload_to='products/images/', blank=True, null=True)
    file = models.FileField(upload_to='products/files/', blank=True, null=True)

    reviews = models.ManyToManyField(Review)

    def __str__(self):
        return self.name
```

Now write the necessary codes to implement a **modified** "Upload product" functionality where the system saves only the products with price more than 100 taka. Write the codes in the following files — 22 (4+4+12+2)

I. upload_product.html
II. forms.py
III. views.py
IV. urls.py

Assume other necessary modules are already implemented and imported in the files.

b) Draw a diagram to demonstrate the interaction among files in Django. — 8

2. a) Suppose one of your team members has written the "Product" and "Cart" model class in the models.py file as following

```
class Product(models.Model):
    name = models.CharField(max_length=100)
    price = models.IntegerField(blank=True)
    category = models.CharField(max_length=100)
    description = models.TextField(blank=True)

    image = models.ImageField(upload_to='products/images/', blank=True, null=True)
    file = models.FileField(upload_to='products/files/', blank=True, null=True)

    reviews = models.ManyToManyField(Review)

    def __str__(self):
        return self.name


class Cart(models.Model):
    user = models.ForeignKey(User, on_delete=models.CASCADE)
    product = models.ManyToManyField(Product)
    created_date = models.DateTimeField(auto_now_add=True, auto_now=False)
    updated_date = models.DateTimeField(auto_now_add=False, auto_now=True)

    def __str__(self):
        return self.user.username
```

Now write the necessary codes to implement the **modified** "Display Cart" functionality. The modified cart only shows the products which have images. Write the codes in the following files — 18 (6+10+2)

I. cart.html
II. views.py
III. urls.py

Assume other necessary modules are already implemented and imported in the files.

b) Suppose you have a functional e-commerce website developed in the Django framework. Now find out the purpose of this following code segment by explaining each code-line. No need to write the codes in your answer script just use the numbers to refer to the code lines. — 12

```
1  def showProducts(request):
2
3      products = Product.objects.all()
4      if request.method == 'POST':
5          products = Product.objects.filter(name__icontains = request.POST['search'])
6          category = Product.objects.filter(category__icontains = request.POST['search'])
7          description = Product.objects.filter(description__icontains = request.POST['search'])
8
9          products = products | category | description
10
11     user_count = User.objects.count()
12     product_count = Product.objects.count()
13
14     context = {
15         'products': products,
16         'u_c': user_count,
17         'p_c': product_count
18     }
19     return render(request, 'ProductManagement/products.html', context)
20
```

3. a) "*Samsung Note 10*" is a smartphone model of Samsung. What should be the best representation of "*Samsung Note 10*" (Abstract class, Class or Object)? Justify your answer. 10

b) The University of Asia Pacific is one of the top-most private universities in Bangladesh and the Department of Computer Science and Engineering (CSE) is the most popular department of this university. CSE department has around 500 active students and 25 faculty members. Mr. Tanmoy Sakar is teaching Python course to the brilliant students of 3-1 semester. 20

Now draw a diagram to represent the above scenario using all the concepts of OOP. You may add new classes or objects to the diagram if necessary.

4. a) Why do we need the concept of inheritance in OOP? 3

b) Explain the different types of inheritance using real-life examples. Just draw class diagrams to explain these. 15

c) Write a python code of the Hybrid inheritance example from answer "b". 12

Or

a) What is the importance of encapsulation? 3

b) Explain the difference between abstract class and interface using real-life examples. 15

c) Write the python code of an Abstract Class "Mobile" and an interface "Camera" considering the necessary functionalities. 12

Department of Computer Science & Engineering

University of Asia Pacific (UAP)

Program: B.Sc. in Computer Science and Engineering

Final Examination	**Spring 2020**	**3rd Year 1st Semester**
Course Code: CSE 311	**Course Title: Microprocessors & Assembly Language**	**Credits: 3**
Full Marks: 120* (Written)		**Duration: 2 Hours**

* Total Marks of Final Examination: 150 (Written: 120 + Viva: 30)

Instructions:

1. There are **Four (4)** Questions. Answer all of them. All questions are of equal value. Part marks are shown in the margins.
2. Non-programmable calculators are allowed.

1. **a)** Draw the internal diagram of the CPU of 8086 and describe each component with your own language. 8+7

b) What is the importance of Stack Segment while implementing procedure mechanism in 8086? What happens in the Stack segment when calling a procedure or returning from a procedure? Explain with necessary diagrams. 4+3+8

2. **a)** Suppose, CS = (Last 4 digit of your student id)H, IP = (Last 4 digit of your best friend's student id)H. Now, find out the physical address according to the given logical address. What will be the starting and ending physical address of the mentioned code segment? 7+8

b) Suppose, AX = (Last 4 digit of your student id) H. 5+5+5

(i) Write a code segment that will set both LSB and MSB bit of AX.

(iI) Write a code segment that will clear the lower byte (AL) of AX.

(iii) Write a code segment that will toggle the upper byte (AH) of AX.

3. **a)** Write an assembly code to input a character then check and response whether it is a digit, alphabet or punctuation mark and display the strings accordingly: 12

i. It is a digit
ii. It is an alphabet
iii. It is a punctuation mark.
iv. Otherwise invalid

b) Write a procedure to find out the sum of even number series up to N, where N is the counting value/ limit of the series. 10

c) Explain the multiplication and division syntax in assembly language, with example code. 8

4. a) Explain the function of data bus transceiver 8286 with the help of DT/$\overline{R}$ and $\overline{DEN}$ and address latch 8282 with the help of ALE. 10

b) Draw the block diagram of 8086 in minimum mode configuration. 10

c) Mention the different control signals that are generated by the bus controller 8288 with the help of the status signals $\overline{S0}$, $\overline{S1}$ and $\overline{S2}$ in 8086 .

OR

a) Illustrate the functions of INTR and $\overline{NMI}$. Define bus operation in 8086. 10

b) Draw the read cycle diagram of 8086 in minimum mode. Also explain the necessary signals generated in bus timing during different clock periods. What is the effect of READY pin during this phase 20

Department of Computer Science & Engineering
University of Asia Pacific (UAP)

Final Examination Spring 2020 3rd Year 1st Semester

Course Code: HSS 301 **Course Title:** English **Credits: 2**

Full Marks: 25 **Duration: 1 Hours 30 Min**

Instructions:

1. ***Marks are indicated in the right margin.**
2. ***Answer all the questions.**

1. Suppose you are Nabil/Nabila. You have recently completed your B.Sc. in Computer Science and Engineering from UAP. Now write a cover letter and a complete CV to apply for the position of an IT Consultant in Datatronic IT Solutions Ltd, the advertisement of which was published on October 12, 2020 in the Daily Prothom Alo. You will apply to the Head of the Human Resource Department of the company. 5+5=10

2. Write an argumentative essay on the following topic: (Write at least 250 words) 10x1=10
"Online education should be banned" Do you agree or disagree? Defend your point of view. 10x1=10

3. Fill in the blanks with the following linking words/phrases. 5x1=5

however/ because/ in addition/ therefore/ although/nonetheless

One of my favorite hobbies is traveling. (a) …….., I decided to get a job that paid me to travel (b) ……..… I just couldn't afford my habit. I worked for a company called Off-road where I led bicycle trips. It was a really hard job. I got to spend two months living and working in France's wine country. (c) …….. I went to the south and stood on the red carpet where they hold the Cannes Film Festival. Riding bikes all summer was great, and traveling around France was incredible. (d) ……, the job was too much work and not enough play. (e) …… it fed my traveling addiction, I knew that job wasn't for me. Finally, I left the job.