

University of Asia Pacific
Department of Computer Science and Engineering
Program: B.Sc. in CSE

Final Examination

Fall-2022

3rd year 1st Semester

Course Code CSE307

Course Title: Theory of Computation

Credit: 3

Time: 3.00 Hour.

Full Mark: 150

Instructions:

1. There are Six (6) 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. Build a DFA that will accept all strings of only 0 and 1 that will start with '0101' or end [10] CO2 with '0101' but not both.
- b. Construct the DFA from the following NFA: [15] CO2
- | | | |
|----|-------|-------|
| | 0 | 1 |
| →A | {B,D} | {B} |
| *B | {C} | {B,C} |
| C | {D} | {A} |
| *D | ∅ | {A} |

OR

- ✓ a. Build an NFA that will accept all strings of only 0 and 1 that will start with '01' and have '0011' as a substring. [10] CO2

- ✓ b. Construct the DFA from the following ε-NFA: [15] CO2
- | | | | | |
|----|-------|-----|-----|-------|
| | ε | p | q | r |
| →a | {b,c} | ∅ | {b} | {c} |
| b | ∅ | {a} | {c} | {a,b} |
| *c | ∅ | ∅ | ∅ | ∅ |

2. ✓ a. Define automata. Explain the necessity studying automata theory? [10] CO1
 b. Define the Pumping Lemma? Why is it used? [15] CO1

OR

- ✓ a. What is the formal definition of Turing Machine? [10] CO1
 b. Define alphabet? Suppose if Σ is an alphabet and $\Sigma^j = \{a, b\}$, then find out Σ^j [15] CO1

a b e e b a

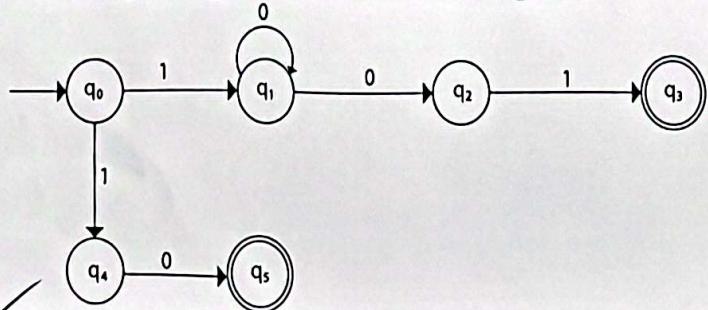
a a a b b b c c c

3. a. Build a Turing Machine that will accept all strings consisting of a, b and c only and in the form $a^n b^n c^n$ [25] CO2

4. a. What is the formal definition of Pushdown Automata? [10] CO1

- b. Build a Pushdown Automata that will accept all strings consisting of a, b and c only in the form ww' where w' is the reverse of w . [15] CO2

5. a. Build a regular expression from the following NFA: [10] CO2



- b. Construct a ϵ -NFA from the following regular expression: $((0+1)01)^*((1+0)1)$ [15] CO2

6. a. Simplify the following DFA using DFA Minimization technique: [10] CO3

	0	1
$\rightarrow a$	b	E
b	*c	*f
*c	d	h
d	e	h
e	*f	*i
*f	g	b
g	h	b
h	*i	*c
*i	a	e

- b. Analyze the string 11011 for a context free grammar for palindromes by constructing the grammar and the leftmost and rightmost parse tree. [15] CO3

University of Asia Pacific
Department of Computer Science and Engineering
Program: B.Sc. in CSE

Final Examination

Fall-2022

3rd year 1st Semester

Course Code: CSE 305 Course Title: System Analysis and Design

Credit: 3

Time: 3.00 Hour.

Full Mark: 150

Instructions:

1. There are Six (6) 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. Explain agile values in detail. [10] CO1
b. Discuss briefly about agile methodology. [15] CO1
2. a. A product manager of company ABC has planned a list of activities to develop a software product as mentioned in the following table. Determine the expected time and the slack of all the activities. [25] CO2

Activity	Predecessor	Time estimates (days)		
		Optimistic (<i>o</i>)	Most likely or Normal (<i>m</i>)	Pessimistic (<i>p</i>)
A	—	2	4	6
B	—	3	5	9
C	A	4	5	7
D	A	4	6	10
E	B, C	4	5	7
F	D	3	4	8
G	E	3	5	8

3. a. The cost summary of business includes facilitation fees of Tk.50,000, materials costing Tk.100,000, salaries of staffs amounting Tk.150,000. The total annual benefit results as Tk.500,000. Calculate Return on Investment (ROI). [10] CO2
b. One of your friends needs \$ 500 now and promised to pay you back \$ 570 in a year. Is that a fruitful investment when you can invest at 10% elsewhere? Solve mathematically. [15] CO2

4. a. Analyze system's requirement considering example of an educational software system where a student can register for different courses. [25] CO3

5. a. Write the major notations of sequence diagram. [10] CO4

- b. Suddenly Anika, Keya, and Hamida have come to visit Tamanna's house. As they met after a long time they wanted to enjoy their time and food together. So they decided to order something from food panda. Food panda is the most popular food delivery app in our country. To order something from the app we need to register in the app using our location and email and as a result food panda will collect our information. Food panda deliver the food through their delivery man and received the payment from us. As the food was delicious Anika was satisfied with their service. So she gave them positive feedback. Design food panda's system using USE CASE diagram.

OR

- a. Write the functions of swimlanes of activity diagram. [10] CO4

- b. There is a volume of students renting books from the library. To regulate this, it's essential for students to have online access to the record of available books. The system will also inform the student if they exceeded the allotted time for renting a book and a penalty will apply accordingly. Develop a library management system using sequence diagram. [15] CO4

6. a. Write the notation of activity diagram. [5] CO4

- b. After the dullness of Covid-19, Cox's Bazar came up with a New Normal tourist place with highly maintained Covid-19 protocols. Two friends X and Y decided to cut the boredom of the lockdown and go to Cox's Bazar as soon as the lockdown ended. Furthermore, Hotel Cox at Cox's Bazar is offering buy 1 get 1 hotel room for the students. So 'X' decided to surprise 'Y' with hotel cox reservation for them. To avail this opportunity, every student must have to register at their website. X's login information will be stored in the database. 'X' selected two rooms as of hotel's offer. After selecting everything 'X' paid the total amount with his/her credit card. This information's are all stored in the database.

Design a sequence diagram based on the above requirements.

OR

- a. Write the purpose of the use case diagram. [5] CO4

- b. Suddenly A, B, and C have come to visit D's house. As they met after a long time they wanted to enjoy their time together and decided to visit a historical place. Hence, they decided to go the historical place by Uber. Uber is the most popular 'transport service providing app' in our country. To get service using the app we need to register in the app using our location, mobile number and email address. Uber app has to collect users' information. Uber provides the services through drivers and received the payment from us. As the driver was experienced, so 'A' was satisfied with the services. So 'A' gave him positive feedback. Design an Uber system using activity diagram.

University of Asia Pacific
Department of Computer Science & Engineering
Semester Final Examination, Fall – 2022
Program: B.Sc. in Computer Science & Engineering
Year: 3rd Semester: 1st

1. Write a summary of the following text in no more than 70 words: (1x10=10)

(A) After 36 days of battling sharks that kept biting their equipment, scientists have returned from the remote Pacific Ocean with a new way of looking at the world's largest - and possibly most mysterious - volcano, Tamu Massif.

(B) The team has begun making 3-D maps that offer the clearest look yet at the underwater mountain, which covers an area the size of New Mexico. In the coming months, the maps will be refined and the data analyzed, with the ultimate goal of figuring out how the mountain was formed.

(C) It's possible that the western edge of Tamu Massif is actually a separate mountain that formed at a different time, says William Sager, a geologist at the University of Houston who led the expedition. That would explain some differences between the western part of the mountain and the main body.

(D) The team also found that the massif (as such a massive mountain is known) is highly pockmarked with craters and cliffs. Magnetic analysis provides some insight into the mountain's genesis, suggesting that part of it formed through steady releases of lava along the intersection of three mid-ocean ridges, while part of it is harder to explain. A working theory is that a large plume of hot mantle rock may have contributed additional heat and material, a fairly novel idea.

(E) Tamu Massif lies about 1,000 miles (1,600 kilometers) east of Japan. It is a rounded dome, or shield volcano, measuring 280 by 400 miles (450 by 650 kilometers). Its top lies more than a mile (about 2,000 meters) below the ocean surface and is 50 times larger than the biggest active volcano on Earth, Hawaii's Mauna Loa. Sager published a paper in 2013 that said the main rise of Tamu Massif is most likely a single volcano, instead of a complex of multiple volcanoes that smashed together. But he couldn't explain how something so big formed. (314 words)

2. Which paragraph above has the following information? Write the correct letter, A-E, in boxes i-v on your answer sheet. (5x1=5)

- i. Possible explanation of the differences between parts of the mountain _____
 - ii. Size data _____
 - iii. A new way of looking _____
 - iv. The start of making maps _____
 - v. A working theory _____

3. Fill in the blanks with appropriate linking words. (5x1=5)

- i. _____ he is short-tempered, I like him.
 - ii. Ask the guard _____ it is time for the train to start?
 - iii. He was _____ tired that he could barely stand.

- iv. _____ I know all the facts, I cannot help you.
 v. _____ men sow, so shall they reap.

4. Change the following sentences into interrogative sentences. (5x1=5)

- i. My mother helped me with my homework yesterday. (make WH-word question)
- ii. Your brother can sing well. (make closed question)
- iii. Ann buys a new car this week. (make WH-word question)
- iv. The postcard came from Spain. (make closed question)
- v. Jim will buy the old guitar. (make WH-word question)

5. Fill in the blanks with appropriate conditionals. (5x1=5)

- i. If I had much money, _____.
- ii. If you heat water to 100 degree centigrade, _____.
- iii. If I had known you were coming, _____.
- iv. If you don't want to miss the train, _____.
- v. Had I the wings of a bird, _____.

6. Suppose you made a movie plan with your closest friend a week ago. However, because of the tremendous pressure of the exams and assignments, you totally forgot about the plan and missed the date. Now write an apology letter to your friend. (1x10=10)

7. Suppose your university is organizing a tech fest next month. This is going to be an inter-university robotics competition. The Head of the Department has asked you to carry out a survey amongst students and then write a report. The Head wants suggestions on:

- who should be the chief guest for the fest
- a present to give the chief guest to appreciate their visit

Write your report in 150 words. (1x10=10)

GOOD LUCK!

University of Asia Pacific
Department of Computer Science and Engineering
Program: B.Sc. in CSE

Final Examination

Fall-2022

3rd Year 1st Semester

Course Code: CSE 311

**Course Title: Microprocessors and Assembly
Language**

Credit: 3

Time: 3.00 Hour.

Full Mark: 150

Instructions:

1. There are Six (6) 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. 'A processor is N-bit ' – what does it imply? [5] CO4
- ✓ b. Draw the block diagram of 8086 architecture. [10] CO1
- ✓ c. Code segment operated in FIFO and stack segment in LIFO, explain with the help of the offset pointer registers used to point these two segments. Why stack is word oriented? [10] CO1

- ✓ 2. a. 8086 has 16-bit data bus but the memory is organized in byte form- How is this dissimilarity compensated? Explain with the diagram of odd and even memory bank. [10] CO1

- ✓ b. If you have four (4) RAM chips of 256KB, then interconnect those with an 8086 processor to allocate 1 MB memory. Draw the diagram including the decoder circuit for memory chip selection. [15] CO1

- ✓ 3. Find out the addressing modes of the operands present in the following instructions and calculate the physical address only for the memory operands: [25] CO2

- i. ADD AX, [BX]
- ii. CMP AX, DX
- iii. MOV AX, A[SI]
- iv. JMP L
- v. CALL PROC
- vi. SUB AL, A[BX] [SI]
- vii. NOP
- viii. INC A

where, SS=0123H, DS=0124H, ES=0987H, CS=0678H, IP=0956H, SI= 0456H
DI= 0378H, BX=0567H, A=09H, PROC= 0009H

- ✓ 4. b. Write assembly program to input three integer values (Byte form) X, Y, C from console, where X, Y>=0 and <=9,
i. If C=0, display the maximum number
ii. If C=1, display the minimum number [15] CO3

✓ 4. Write an assembly program to find out the sum of the following series up to N (where 0 < N < 9) and put the sum in AX.

$$1+3+5+7+\dots$$

1 3 5 7

✓ 5. a. Briefly describe the characteristics that can distinguish a better processor. [10] CO4

b. Suppose AL = (Last two digit of your Registration number) H and CL=2, Show the output bit pattern after execution of the following instructions:

- i. SHR AL, CL
- ii. SHL AL, CL
- iii. ROL AL, CL
- iv. ROR AL, CL
- v. RCR AL, CL

OR

✓ 6. a. Pipelining can speed up processor- How? Explain from the view of 8086 architecture. [10] CO4

b. Suppose AL = (Last two digit of your Registration number) H, write the corresponding logic instruction with the necessary mask bit pattern to do the followings:

- i. Set bit 0,3,7
- ii. Reset bit 2, 4 6
- iii. Complement bit 5,6
- iv. Toggle AL
- v. No change AL

✓ 6. a. Assembly is procedure oriented, then what is the difference between MAIN procedure and others? Explain the application of stack RETURN and CALL operation. [10] CO3

b. Discuss on status of FLAG (CF, AF, OF, PF, ZF, SF) after execution of the following instructions:

- i. ADD/SUB
- ii. INC/DEC
- iii. NEG
- iv. AND/OR/XOR/ NOT
- v. SHR/SHL

c. Logic operation has no carry- prove [5] CO4

OR

a. Draw the minimum mode configuration diagram of 8086. [10] CO3

b. Briefly mention the function of the following pins: [10] CO3

- i. DEN
- ii. ALE
- iii. M/IO
- iv. DT/R
- v. CLK

c. If 8086 has 5MHZ clock speed, then what is the bus timing? [5] CO4

University of Asia Pacific
Department of Computer Science and Engineering
Program: B.Sc. in CSE

Final Examination

Fall-2022

3rd year 1st Semester

Course Code: CSE 309

Course Title: Object Oriented Programming II:

Credit: 3

Visual and Web Programming

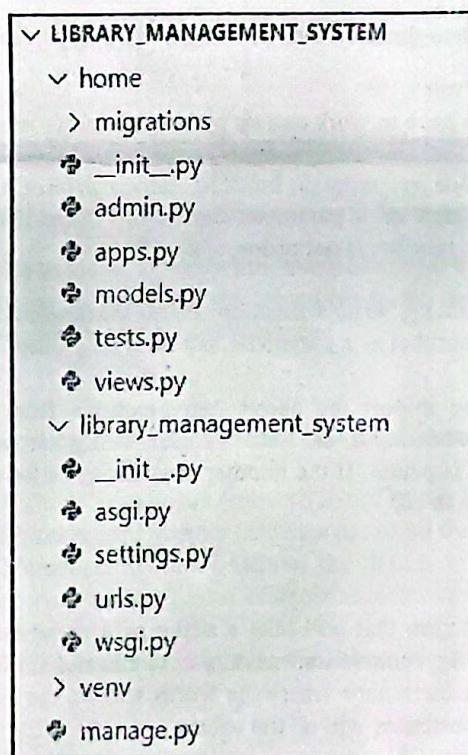
Time: 3.00 Hour.

Full Mark: 150

Instructions:

1. There are Six (6) 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. Suppose we are working on a django project called "*library_management_system*". The project structure is as follows.



2. We want to add a URL to our website which will act as our homepage. Describe the [15] COS steps with the necessary codes. Add additional folders or files to the structure if necessary.

b. Describe how a compiler and an interpreter deal with errors in a code.

[10] CO1

OR

a. What is the MVC pattern? Demonstrate with examples from the above django project [15] CO5 structure.

b. Describe how interpreters are different from compilers. [10] CO1

2. a. The formula for nC_r (combination of r elements from a set of n elements) is:

[10] CO2

$${}^nC_r = {}^{n-1}C_r + {}^{n-1}C_{r-1}$$

The formula for nP_r (permutation of r elements from a set of n elements) is:

$${}^nP_r = n!/(n-r)!$$

Using the above formulae:

- i. write a python recursive function that will take n and r as parameters and return the value of nC_r ,
- ii. write a python function that will take n and r as parameters and return the value of nP_r ,

b. In this problem, we have to work on two python modules - *mymodule.py* and *main.py*. [15] CO2

- i. In *mymodule.py*, write a function named *primeCheck(n)* that will take an integer number as a parameter and return *True* if the number is prime and *False* if the number is not prime.
- ii. In *mymodule.py*, write a function named *multiplicationTable(n)* that will take an integer number as a parameter and print its multiplication table.
- iii. In *main.py*, import the above two functions from *mymodule.py*. Take an integer number input, *m*, from the user. Using the function in (i) check if the number, *m* is prime. If the number is prime, print its multiplication table using the function in (ii)

OR

a. Write a python function that will take a string as a parameter. It will then parse the words from the string, remove unnecessary commas and full stops from the end of the words and return a dictionary where the words will be the keys of the dictionary and their number of occurrences will be the values. [15] CO2

b. Imagine, we have two files, *input.txt*, and *output.txt*, where *input.txt* contains several words in separate lines, and each line has exactly one word. [10] CO2

Write a python code that will read the file *input.txt*, and write all the distinct words in the *output.txt* file in separate lines.

3. We have to create a website for the Ekushe Boimela 2024. In our website backend, we have to work on two database tables: *Book* and *Author*. The schematic diagram of the database tables is as follows.

Book(id(primary key), name, genre, publication, Author.id(foreign key))
Author(id(primary key), name, photo)

We have the following two apps to handle books and authors.

<ul style="list-style-type: none">✓ author<ul style="list-style-type: none">> migrations✗ _init_.py✗ admin.py✗ apps.py✗ models.py✗ tests.py✗ views.py	<ul style="list-style-type: none">✓ book<ul style="list-style-type: none">> migrations✗ _init_.py✗ admin.py✗ apps.py✗ models.py✗ tests.py✗ views.py
--	--

- a. Write appropriate codes in the *models.py* files to create the database tables. [10] CO5
b. Write appropriate codes to create a page where users can input the details of a book in a form and the information of the book will be added to the *Book* table. You may use django forms or HTML forms at your convenience. [15] CO5

4. Suppose we have created our website- www.ekusheboimela.com
On our website there are three URLs -
i. www.ekusheboimela.com/books (shows a list of all the books)
ii. www.ekusheboimela.com/authors (shows a list of all the authors)
iii. www.ekusheboimela.com/book/2 (shows the details of a book with id 2, here the URL takes a parameter; 2 is an example value of that parameter)

We have two tables for the books and authors. The schematic diagram for the tables are as follows.

Book(id(primary key), name, genre, publication, Author.id(foreign key))
Author(id(primary key), name, photo)

a. ✓ Write url patterns in *urls.py* for these urls, and write three view functions in *views.py* file, so that appropriate data is passed to the HTML templates from the view functions as context. You do not need to write codes in the HTML files, only mention the names of the HTML files in the view functions. [15] CO5

b. ✓ On our websites, sometimes clicking on a link leads us from one page to another. We do this by using anchor tags and hypertext references (*href*). [10] CO5

Show how we can route from one page to another in django HTML.

There may be two different cases:

- i. We want to go to a page that is on a different website (for example <https://cse.uap-bd.edu/>).
- ii. We want to go to a page that is on our own website.

Q5. a. Suppose we have the classes - Animal, Mammal, Fish, WaterAnimal, Shark, and Whale, Human. Find out the different types of inheritance among these classes. [20] CO3

For any two parent-child classes, show with example code, how you can use inheritance among them, and demonstrate the followings-

- i. use parent class constructor to implement child class constructor
- ii. method overriding
- iii. using inherited method without overriding it

b. ✓ What happens when a child class inherits a method with the same name from two different parent classes? [5] CO3

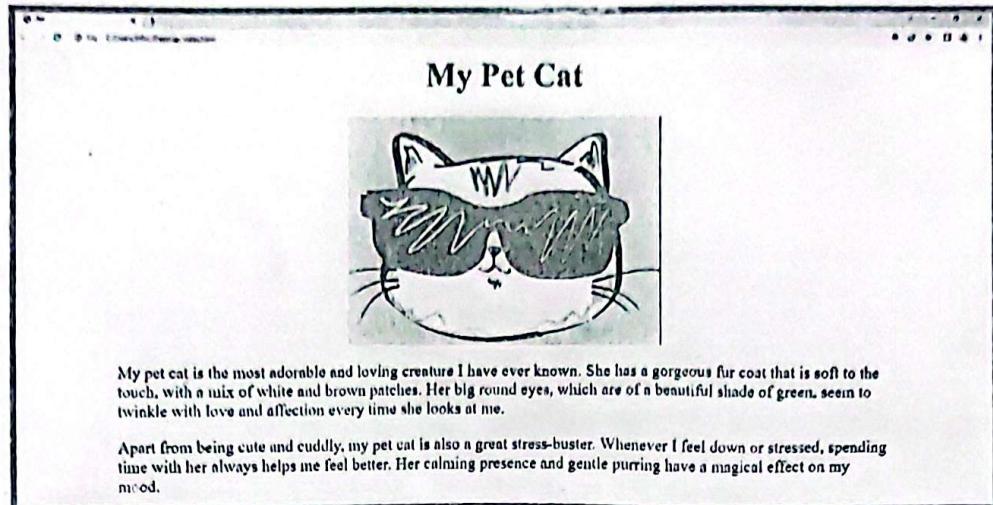
6. a. ✓ Imagine you want to create a web page for your pet cat. You have your pet cat's photo in a file named "*pet.jpg*". You have your *index.html* and *pet.jpg* files in the same directory. [15] CO4

Write HTML & CSS code in the *index.html* file to create a webpage as the following output. In the webpage, there will be a photo of your cat and the following two paragraphs about your cat.

"My pet cat is the most adorable and loving creature I have ever known. She has a gorgeous fur coat that is soft to the touch, with a mix of white and brown patches. Her big round eyes, which are of a beautiful shade of green, seem to twinkle with love and affection every time she looks at me."

Apart from being cute and cuddly, my pet cat is also a great stress-buster. Whenever I feel down or stressed, spending time with her always helps me feel better. Her calming presence and gentle purring have a magical effect on my mood."

Title of the webpage is "Pet".



- b. Write HTML & CSS code to design the following table with its label. [10] CO4

Table: Marks of Students in Math		
Sl No	Name	Marks
1	Sifat Md Abdullah	82
2	Mirajul Islam	85
3	Tahrina Tasnim	100
4	Hasanur Rahman	90

"stylesheet.css"

University of Asia Pacific
Department of Computer Science and Engineering
Program: B.Sc. in CSE

Final Examination

Fall-2022

3rd Year 1st Semester

Course Code: CSE 303

Course Title: Data Communication

Credit: 3

Time: 3.00 Hour.

Full Mark: 150

Instructions:

1. There are Six (6) 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. Differentiate between Data and signal with a suitable example. [5] CO1
- ✓ b. Define link and channel. A point to point link is secured than multipoint- why? Give examples. [5] CO1
- ✓ c. What are the requirements of a reliable communication system? List out. [5] CO1
- ✓ d. Discuss on different transfer modes. Which one is efficient? Why? [10] CO1
- ✓ 2. a. Compare the performance of Bus and Star topologies with their mentionable properties and proper diagram. Draw a hybrid topology diagram using bus and star. [10] CO1
- ✓ b. Define the time domain concept of signal. If a signal has a bandwidth 2400KHz and the starting frequency is 200KHz then what is the ending frequency? [10] CO2
- ✓ c. What are the differences between analog and digital transmission? [5] CO1
- ✓ 3. a. Define data synchronization. Which line coding techniques are self-synchronizing? Mention the names. [10] CO2
- ✓ b. Draw the wave shape of digital signal using the bit stream (10010101) for the following coding systems:
i. NRZ-L
ii. NRZ-I
iii. RZ
iv. Manchester
v. Differential Manchester
vi. Bipolar AMI

Timeline

4. a. If binary data is needed to be transferred in analog form, then what are the three basic modulation schemes? Discuss in brief and show the modulator output for a bit stream (101101) using the three techniques. [15] CO2
- b. Discuss on different steps of Pulse Code Modulation (PCM). [10] CO2

OR

- a. What is attenuation? How do they affect the analog and digital signals? If a signal has initial power 200 watts and after some time interval it becomes 168 watts then calculate the loss of the signal. [15] CO2
- b. Delay distortion has a significant effect on digital signal - Explain. Calculate the thermal noise of a medium with bandwidth 100Hz at temperature 50° K, where Boltzmann's constant = $1.3803 \times 10^{-23} \text{ J}/\text{K}$. [10] CO2

5. a. Define optical fiber communication principle and light propagation through optical fiber cable. Use diagram if needed. What is critical angle? [10] CO3
- b. Describe the modes step-index and graded-index of optical fiber media. [10] CO3
- c. If the velocity of light in air is $3 \times 10^8 \text{ m/sec}$ and in a medium it is $2 \times 10^8 \text{ m/sec}$ then calculate the refractive index of that medium. [5] CO3

OR

- a. Which mechanism in twisted pair can overcome crosstalk and interference? Explain. [10] CO3
- b. How does satellite work? Why are they called transponders? [10] CO3
- c. What is the data rate of Fast Ethernet? CAT5 has how many wires? [5] CO3

6. a. Give brief introduction of layers in TCP/IP model. Draw the working model. [20] CO4
- b. Why OSI is called a reference model? How many layers are there? [5] CO4