EXCEL ENGINEERING COLLEGE

(Autonomous)

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai
Accredited by NBA, NAAC with "A+" and Recognised by UGC (2f &12B)
KOMARAPALAYAM – 637303

DEPARTMENT OF COMPUTER SCIENCE ENGINEERING

20CS406-DATA COMMUNICATION AND COMPUTER NETWORKS LABORATORY

REFERENCE MANUAL

VISION AND MISSION STATEMENTS OF INSTITUTEVISION

To create competitive human resource in the fields of engineering for thebenefit of society to meet global challenges.

MISSION

- To provide a conducive ambience for better learning and to bring creativityin the students
- To develop sustainable environment for innovative learning to serve theneedy
- To meet global demands for excellence in technical education
- To train young minds with values, culture, integrity, innovation andleadership

Vision of Department

To create better quality technical engineers in computer science and engineering with ethically strong values which cater local and global needs of the society.

Mission of Department

- To instill quality in engineering education that demands excellence
- To initiate desires among the students to work in close cooperation and collaboration with industry and professional bodies
- To train the students for developing software and novel software systems
- To create ambience for taking initiatives towards entrepreneurship and lifelong learning

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DEPARTMENT OF CSE

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

I. To provide fundamental knowledge to formulate, solve, analyze engineering problems and to pursue higher studies

II. To develop the ability of the students in comprehending, analyzing and synthesizing data in order to design software and to create novel software systems

III. To inculcate effective communication skills, team skills, professional and ethical attitude in the students for enabling them to relate engineering issues with social issues in a broader context

IV. To provide students managerial and leadership skills so as to make them successfully employed and to demonstrate a pursuit of lifelong learning in multidisciplinary environment

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PROGRAMME OUTCOMES [Pos]

1.**Engineering Knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

2.**Problem Analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3.**Design / Development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4.**Conduct investigations of complex problems**: Use research-based knowledge and research methods, including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5.**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling of complex engineering activities with an understanding of the limitations.

6.**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and Sustainability**: Understand the impact of the professional engineering solutions to societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work**: Function effectively as an individual and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Lifelong learning:** Recognize the need for and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

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PROGRAMME SPECIFIC PROGRAMME OUTCOMES

1. An ability to learn about recent trends in all domains to solve the real world problems
2. To play a vital team role to enrich their design and development skills

20CS406	DATA COMMUNICATION AND COMPUTER NETWORKS LABORATORY (Common to CSE, IT)	L	T	P	C
		0	0	4	2
Nature of Course	Engineering Sciences				
Pre requisites	Basic Network Concepts				

Course Objectives

The course is intended to

1. Learn and use network commands.
2. Develop the error correction codes.
3. Implement and analyze various network protocols.
4. Implement the TCP UDP
5. Use simulation tools to analyze the performance of application layer protocol.

Course Outcomes

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO1	Practicing various network commands.	Apply
CO2	Implement error correction codes.	Apply
CO3	Use simulation tools to analyze the performance of various network protocols.	Analyze
CO4	Compare the performance of different transport layer protocols.	Apply
CO5	Analyze Application Layer Protocols	Analyze

Laboratory Components

S.No	List of Exercises	CO Mapping	RBT
1	Learn to use commands like tcpdump, netstat, ifconfig, nslookup and traceroute. Capture ping and traceroute PDUs using a network protocol analyzer and examine.	CO1	Apply
2	Write a code for error correction and detection (like CRC).	CO2	Apply
3	Implement Flow control mechanisms in Data link control	CO2	Apply
4	Write a code simulating ARP /RARP protocols.	CO2	Analyze
5	Study of Network simulator (NS) and Simulation of Congestion Control Algorithms using NS.	CO3	Apply
6	Simulation of Distance Vector/ Link State Routing algorithm.	CO3	Analyze
7	Write a HTTP web client program to download a web page using TCP sockets.	CO4	Apply
8	Applications using TCP sockets like: a)Echo client and echo server b) Chat c) File Transfer	CO4	Analyze
9	Study of TCP/UDP performance using Simulation tool.	CO4	Apply
10	Simulation of DNS using UDP sockets.	CO5	Apply

TOTAL: 60 Periods

Mapping of Course Outcomes (CO) with Programme Outcomes (PO) Programme Specific Outcomes (PSO)															
	Pos												PSOs		
COs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	2	3	3	2									2	3	
2	2	3	3	2									2	3	
3	2	3	3	2									2	3	
4	2	3	3	2									2	3	
5	2	3	3	3									2	3	
	3	High				2	Medium					1	Low		

Summative assessment based on Continuous and End Semester Examination		
Bloom's Level	**Rubric based Continuous Assessment [50 marks]**	**End Semester Examination [50 marks]**
Remember		
Understand	10	20
Apply	20	40
Analyze	20	40
Evaluate		
Create		

LIST OF EXPERIMENTS

CYCLE-I

S.No	List of Exercises	CO Mapping	RBT
	CYCLE-1		
1	Learn to use commands like tcpdump, netstat, ifconfig, nslookup and traceroute. Capture ping and traceroute PDUs using a network protocol analyzer and examine.	CO1	Apply
2	Write a code for error correction and detection (like CRC).	CO2	Apply
3	Implement Flow control mechanisms in Data link control	CO2	Apply
4	Write a code simulating ARP /RARP protocols.	CO2	Analyze
5	Study of Network simulator (NS) and Simulation of Congestion Control Algorithms using NS.	CO3	Apply
	CYCLE-2		
6	Simulation of Distance Vector/ Link State Routing algorithm.	CO3	Analyze
7	Write a HTTP web client program to download a web page using TCP sockets.	CO4	Apply
8	Applications using TCP sockets like: a)Echo client and echo server d) Chat e) File Transfer	CO4	Analyze
9	Study of TCP/UDP performance using Simulation tool.	CO4	Apply
10	Simulation of DNS using UDP sockets.	CO5	Apply
	CONTENT BEYOND SYLLABUS		
11	Token Ring Protocol	CO4	Apply
12	Implementation and Study of CSMA/CD	CO5	Apply

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Expt.No	Name of theExperiment	Page No	Marks Allotted	Marks Given	Signature
1	Learn to use commands like tcpdump, netstat, ifconfig, nslookup and traceroute. Capture ping and traceroute PDUs using a network protocol analyzer and examine.				
2	Write a code for error correction and detection (like CRC).				
3	Implement Flow control mechanisms in Data link control				
4	Write a code simulating ARP /RARP protocols.				
5	Study of Network simulator (NS) and Simulation of Congestion Control Algorithms using NS.				
6	Simulation of Distance Vector/ Link State Routing algorithm.				
7	Write a HTTP web client program to download a web page using TCP sockets.				
8	Applications using TCP sockets like: a)Echo client and echo server f)Chat File Transfer				
9	Study of TCP/UDP performance using Simulation tool.				
10	Simulation of DNS using UDP sockets.				
11	Token Ring Protocol				
12	Implementation and Study of CSMA/CD				

Ex. No. 1	STUDY OF BASIC NETWORK COMMANDS

AIM

To learn the use of commands like tcpdump, netstat, ifconfig, nslookup and traceroute.

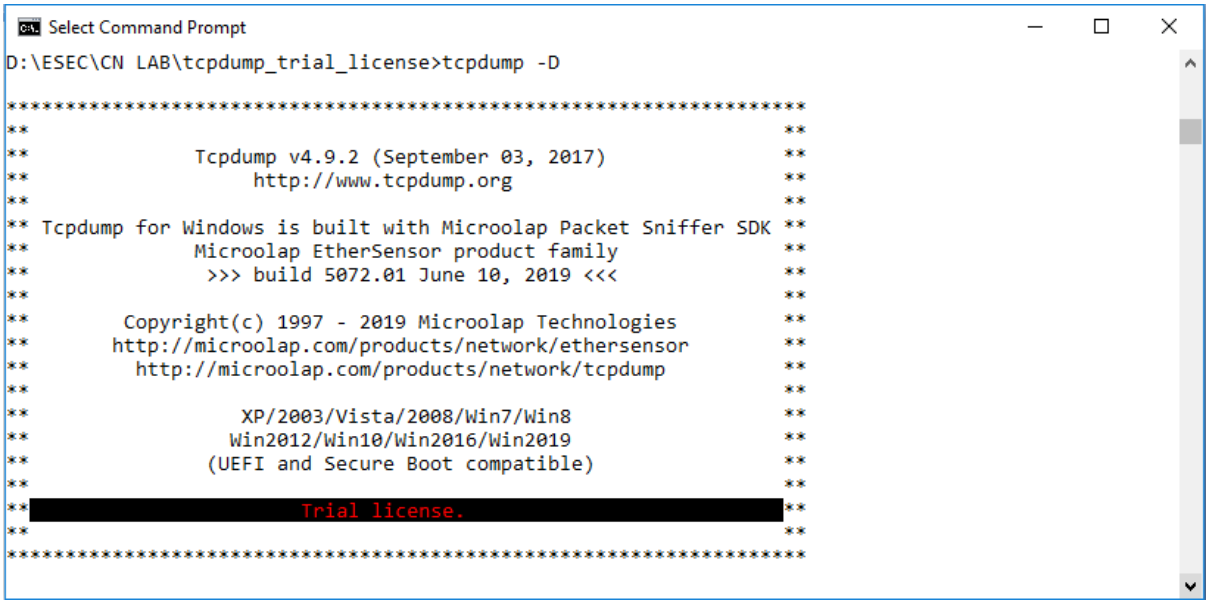
COMMANDS

1. tcpdump

- Tcpdump is a common packet analyzer that runs under the command line. It allows the user to display TCP/IP and other packets being transmitted or received over a network to which the computer is attached. Distributed under the BSD license, tcpdump is free software.
- Download and install tcpdump using the link
https://www.microolap.com/products/network/tcpdump/download/
- Change directory to the installed path and execute tcpdump command

- **OUTPUT**

D:\ESEC\CN LAB\TCPDUMP>tcpdump -D



2. netstat

- Using the Netstat command displays a variety of statistics about a computer's active TCP/IP connections. It's a useful tool to use when you're having trouble with TCP/IP applications, such as File Transfer Protocol (FTP), HyperText Transport Protocol (HTTP), and so on.

- If you run netstat without specifying any parameters, you get a list of active connections on the computer and indicates the local port used by the connection, as well as the IP address and port number for the remote computer.

C:\Users\TAMIL>netstat

Active Connections

Proto	Local Address	Foreign Address	State
TCP	127.0.0.1:1521	localhost0:53097	TIME_WAIT
TCP	127.0.0.1:51294	localhost0:51295	ESTABLISHED
TCP	127.0.0.1:51295	localhost0:51294	ESTABLISHED
TCP	127.0.0.1:51297	localhost0:51298	ESTABLISHED
TCP	127.0.0.1:51298	localhost0:51297	ESTABLISHED
TCP	127.0.0.1:51304	localhost0:51305	ESTABLISHED
TCP	127.0.0.1:51305	localhost0:51304	ESTABLISHED
TCP	127.0.0.1:51308	localhost0:51309	ESTABLISHED
TCP	127.0.0.1:51309	localhost0:51308	ESTABLISHED

- If user, use an -e switch, netstat displays various protocol statistics

C:\Users\TAMIL>netstat –e

Interface Statistics

	Received	Sent
Bytes	304128934	51901021
Unicast packets	385595	342824
Non-unicast packets	0	3078
Discards	0	0
Errors	0	2
Unknown protocols	0	

3. ipconfig

- IPCONFIG command displays detailed information about the network. ipconfig/all command gives more detailed information such as DNS server, MAC address, IP address etc.,

C:\Users\TAMIL>ipconfig/all

Windows IP Configuration

Host Name . . . . . : DESKTOP-I9S8GJ2
Primary Dns Suffix . . . . . :
Node Type . . . . . : Hybrid
IP Routing Enabled. . . . . : No
WINS Proxy Enabled. . . . . : No

Ethernet adapter Ethernet:

Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . :
Description . . . . . : Realtek PCIe FE Family Controller
Physical Address. . . . . : 78-2B-CB-E7-44-AD
DHCP Enabled. . . . . : Yes
Autoconfiguration Enabled . . . . : Yes

Wireless LAN adapter Wi-Fi:

Connection-specific DNS Suffix . :
Description . . . . . : Intel(R) Centrino(R) Wireless-N 1000
Physical Address. . . . . : 8C-A9-82-5E-A7-24
DHCP Enabled. . . . . : Yes
Autoconfiguration Enabled . . . . : Yes
Link-local IPv6 Address . . . . . : fe80::e517:e7c7:6cb7:69d%10(Preferred)
IPv4 Address. . . . . : 192.168.43.209(Preferred)
Subnet Mask . . . . . : 255.255.255.0
Lease Obtained. . . . . : 08 July 2019 20:19:31
Lease Expires . . . . . : 08 July 2019 23:11:58
Default Gateway . . . . . : 192.168.43.1
DHCP Server . . . . . : 192.168.43.1
DHCPv6 IAID . . . . . : 59550082
DHCPv6 Client DUID. . . . . : 00-01-00-01-22-35-61-84-78-2B-CB-E7-44-AD
DNS Servers . . . . . : 192.168.43.1
NetBIOS over Tcpip. . . . . : Enabled

4. nslookup

• nslookup is a network administration command-line tool available in many computer operating systems for querying the Domain Name System (DNS) to obtain domain name or IP address mapping, or other DNS records.

• When you type nslookup in front of command prompt, it does two things
○ It displays the name and IP address of your computers default DNS server
○ It also displays a small prompt that is nslookup own prompt. Here user type the domain name or IP address, which resolves the given domain or IP address

C:\Users\TAMIL>nslookup

Default Server: UnKnown
Address: 192.168.43.1

> annauniv.edu
Server: UnKnown
Address: 192.168.43.1
Non-authoritative answer:
Name: annauniv.edu
Address: 103.70.60.38

> 103.70.60.38
Server: UnKnown
Address: 192.168.43.1
Name: chennai-anna-university-static-38.60.70.103.powergrid.in
Address: 103.70.60.38

> www.erode-sengunthar.ac.in
Server: UnKnown
Address: 192.168.43.1
Non-authoritative answer:
Name: excel engineering college.ac.in
Address: 216.10.241.191
Aliases: www.erode-sengunthar.ac.in

> 216.10.241.191
Server: UnKnown
Address: 192.168.43.1
Name: bh-in-36.webhostbox.net
Address: 216.10.241.191

5. traceroute

traceroute and tracert are computer network diagnostic commands for displaying the route (path) and measuring transit delays of packets across an Internet Protocol (IP) network. The history of the route is recorded as the round-trip times of the packets received from each successive host (remote node) in the route (path); the sum of the mean times in each hop is a measure of the total time spent to establish the connection. Hop number, 3-columns (RTT) Round Trip Time for your packet to reach that point and return your computer.

C:\Users\TAMIL>tracert google.com

Tracing route to google.com [172.217.163.46]
over a maximum of 30 hops:

1	3 ms	2 ms	3 ms	192.168.43.1	
2	712 ms	1177 ms	664 ms	10.206.157.10	
3	*	*	*	Request timed out.	
4	95 ms	77 ms	*	10.206.30.57	
5	115 ms	79 ms	74 ms	dsl-ncr-dynamic-021.100.16.125.	
airtelbroadband.in [125.16.100.21]					
6	91 ms	82 ms	76 ms	182.79.236.125	
7	104 ms	86 ms	87 ms	72.14.211.198	
8	103 ms	88 ms	88 ms	74.125.242.129	
9	88 ms	78 ms	77 ms	216.239.42.235	
10	91 ms	77 ms	77 ms	maa05s01-in-f14.1e100.net	

[172.217.163.46]

Trace complete.

RESULT:

Thus the use of commands like tcpdump, netstat, ifconfig, nslookup and traceroute program was learnt and output is verified successfully.

Ex. No. 2	IMPLEMENTATION OF CRC

AIM

To write a java program to implement CRC Error detection code

ALGORITHM

Step 1: Start the program
Step 2: Get the generator, data from the user
Step 3: Generate the transmission code by dividing the data by generator input
Step 4: Get the received code from the user
Step 5: Divide the received code by the generator
Step 6: If the remainder is zero, print "Received code contains no error"
Step 7: If the remainder is not zero, print "Received code contains error"

PROGRAM
CRC_CODE.java

```
import java.io.*;
class CRC_CODE
{
  public static void main(String args[]) throws IOException
  {
        BufferedReader br = new BufferedReader(new InputStreamReader(System.in));
        System.out.println("Enter Generator:");
        String gen = br.readLine();
        System.out.println("Enter Data:");
        String data = br.readLine();
        String code = data;
        while(code.length() < (data.length() + gen.length() - 1))
              code = code + "0";
        code = data + div(code,gen);
        System.out.println("The transmitted Code Word is: " + code);
        System.out.println("Please enter the received Code Word: ");
        String rec = br.readLine();
        if(Integer.parseInt(div(rec,gen)) == 0)
              System.out.println("The received code word contains no errors.");
        else
              System.out.println("The received code word contains errors.");
  }
  static String div(String num1,String num2)
  {
        int pointer = num2.length();
        String result = num1.substring(0, pointer);
        String remainder = "";
        for(int i = 0; i < num2.length(); i++)
        {
              if(result.charAt(i) == num2.charAt(i))
```

```
                                        remainder += "0";
                        else
                                        remainder += "1";
                }
                while(pointer < num1.length())
                {
                        if(remainder.charAt(0) == '0')
                        {
                                        remainder = remainder.substring(1, remainder.length());
                                        remainder = remainder + String.valueOf(num1.charAt(pointer));
                                        pointer++;
                        }
                        result = remainder;
                        remainder = "";
                        for(int i = 0; i < num2.length(); i++)
                        {
                                        if(result.charAt(i) == num2.charAt(i))
                                                remainder += "0";
                                        else
                                                remainder += "1";
                        }
                }
                return remainder.substring(1,remainder.length());
        }
}
```

OUTPUT:

```
D:\TAMIL\CN LAB\PROGRAM>javac CRC_CODE.java
D:\TAMIL\CN LAB\PROGRAM>java CRC_CODE
Enter Generator:
1001
Enter Data:
1010000
The transmitted Code Word is: 1010000011
Please enter the received Code Word:
1010000011
The received code word contains no errors.


D:\TAMIL\CN LAB\PROGRAM>java CRC_CODE
Enter Generator:
1001
Enter Data:
1010000
The transmitted Code Word is: 1010000011
Please enter the received Code Word:
1011100011
The received code word contains errors.
D:\TAMIL\CN LAB\PROGRAM>
```

Result:

Thus the given program has been created & executed successfully.