**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**

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# EXCEL ENGINEERING COLLEGE

## KOMARAPALAYAM

**VISION AND MISSION STATEMENTS OF INSTITUTE VISION**

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

## MISSION

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

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## KOMARAPALAYAM

**DEPARTMENT OF CSE**

**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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## KOMARAPALAYAM

### DEPARTMENT OF CSE

**PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)**

1. To provide fundamental knowledge to formulate, solve, analyze engineering problems and to pursue higher studies
2. To develop the ability of the students in comprehending, analyzing and synthesizing data in order to design software and to create novel software systems
3. 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
4. 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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## KOMARAPALAYAM

**DEPARTMENT OF CSE**

**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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## KOMARAPALAYAM

**DEPARTMENT OF CSE**

**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   1. Chat 2. 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**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mapping of Course Outcomes (CO) with Programme Outcomes (PO) Programme Specific**  **Outcomes (PSO)** | | | | | | | | | | | | | | | |
| **COs** | **Pos** | | | | | | | | | | | | **PSOs** | | |
| **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   1. Chat 2. 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 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **INDEX** | | | | | |
| **Expt. No** | **Name of the Experiment** | **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. |  |  |  |  |
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| 10 | Simulation of DNS using UDP sockets. |  |  |  |  |
| 11 | Token Ring Protocol |  |  |  |  |
| 12 | Implementation and Study of CSMA/CD |  |  |  |  |

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| --- | --- |
| **Ex. No. 1** | **STUDY OF BASIC NETWORK COMMANDS** |
|  |

**AIM**

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

**COMMANDS**

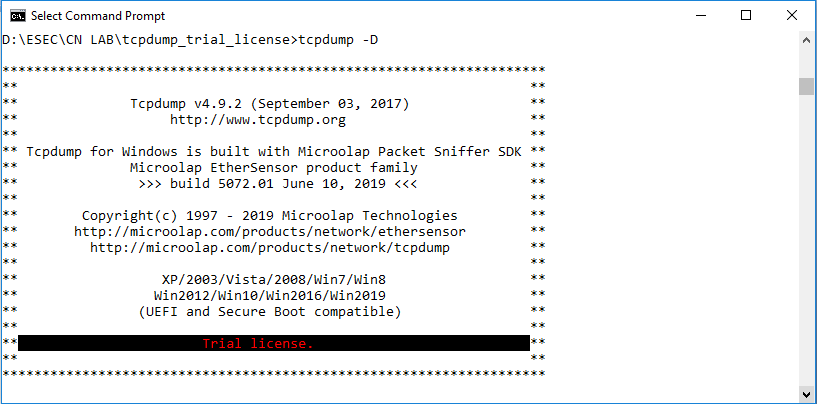
**1. tcpdump**

* 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](http://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.