Techno India NJR Institute of Technology

Course File

Computer Networks (6EC4- 02)

Mr. Akhilesh Deep Arya
(Assistant Professor)
Department of CSE

6EC4-02: Computer Network

Credit: 3   **Max. Marks: 150(IA:30, ETE:120)**

3L+0T+0P   **End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Queuing Theory- Pure birth, Pure death & Birth-death processes, Mathematical models for $M/M/1$, $M/M/\infty$, $M/M/m$, $M/M/1/K$ and $M/M/m/m$ queues. Little's formula.	7
3	Introduction to computer networks and the Internet: Application layer: Principles of network applications, The Web and Hyper Text Transfer Protocol, File transfer, Electronic ail, Domain name system, Peer-to-Peer file sharing, Socket programming, Layering concepts. Packet switching, Blocking in packet switches, Three generations of packet switches, switch fabric, Buffering, Multicasting, Statistical Multiplexing.	9
4	Transport layer: Connectionless transport - User Datagram Protocol, Connection oriented transport – Transmission Control Protocol, Remote Procedure Call. Congestion Control and Resource Allocation: Issues in Resource Allocation, Queuing Disciplines, TCP congestion Control, Congestion Avoidance Mechanisms and Quality of Service.	9
5	Network layer: Virtual circuit and Datagram networks, Router, Internet Protocol, Routing algorithms, Broadcast and Multicast routing	7
6	Link layer: ALOHA, Multiple access protocols, IEEE 802 standards, Local Area Networks, addressing, Ethernet, Hubs, Switches.Fundamental of SDN, Open flow.	7

Course Overview:

This 38 hours course provides an introduction to computer networks, Students will Internet architecture and protocols. Topics include layered network architectures, addressing, naming, forwarding, routing, communication reliability, the client-server model, and web and email protocols. Besides the theoretical foundations, students acquire practical experience by programming reduced versions of real Internet protocols.

This course is extremely important for the students who aim to make their career in the field of networks. This subject has significant weightage in the exams like GATE.

Course Outcomes:

CO. NO.	Cognitive Level	Course Outcome
1	Knowledge	Students will learn how networked computing devices pass data to each other along data connections
2	Knowledge	Student will study different application level protocols such as FTP, SMTP and, HTTP
3	Application	Students will study different routing algorithms. The will be able to apply the concept of sub-netting and derived IPs for subnets.
4	Application	Student should learn and apply the leaky and token bucket algorithms for traffic shaping.
5	Knowledge	Students will learn about types of errors, and error detection & correction methods such as stop and weight, Go-Back-N. They will also study about ALOHA and Slotted ALOHA.

Course Outcome Mapping with Program Outcome:

Course Outcome	Program Outcomes (PO's)											
CO. NO.	Domain Specific (PO)					Domain Independent (PO)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	2	2	3	2	1	1	-	1	2
CO2	2	2	1	2	2	3	2	1	1	-	1	2
CO3	2	2	1	2	2	3	2	1	1	-	1	2
CO4	2	2	1	2	2	3	2	1	1	-	1	2
CO5	2	2	1	2	2	3	2	1	1	-	1	2
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

Course Coverage Module Wise:

Lecture No.	Unit	Topic
1	1	**Introduction:** Objective, scope and outcome of the course.

2	**2**	**Introductory Concepts**
3	2	Queuing Theory
4	2	Pure Birth death
5	2	Mathematical formats
6	2	Little's formula
7	**3**	**Application Layer**
8	3	WWW
9	3	DNS
10	3	Multimedia, Electronic mail
11	3	FTP
12	3	HTTP, SMTP
13	3	Introduction to network security
14	4	**Transport Layer**
15	4	Transport service
16	4	Elements of transport protocols
17	4	User Datagram Protocol
18	4	Transmission Control Protocol
19	4	Quality of service
20	4	Leaky Bucket and Token Bucket algorithm
21	5	**Network Layer**
22	5	Design issues
23	5	Routing algorithms
24	5	IPV4, IPV6, Address mapping
25	5	ARQ, RARQ
26	5	Congestion control
27	5	Unicast, Multicast, Broadcast routing protocols
28	5	Quality of Service, Internetworking
29	6	**Data Link Layer**
30	6	Error Detection and Correction, Types of Errors, Two dimensional parity check
31	6	Detection verses correction, Block Coding, Linear Block Coding, Cyclic Codes
32	6	Checksum, Standardized Polynomial Code
33	6	Error Correction Methods
34	6	Forward Error Correction, Protocols
35	6	Stop and wait, Go-back-N ARQ
36	6	Selective Repeat ARQ, Sliding window, Piggy backing
37	6	Pure ALOHA, Slotted ALOHA
38	6	CSMA/CD, CSMA/CA

TEXT/REFERENCE BOOKS

1. Tanenbaum; Computer Network, 4th Ed., Pearson.
2. Kurose; Computer Networking, 3rd Ed., Pearson.
3. Peterson, Davie; Computer Networks, 4rd Ed., ELSEVIER

Course Level Problems (Test Items):

CO.NO.	Problem description
1	A. List any 4 differences between OSI and TCP/ IP model. B. What do you understand by ALOHA?
2	A. A pure ALOHA network transmit 200-bits frames on a shared channel of 200 kbps. What is the throughput if the system produces 1000 frames per second? B. Explain Leaky bucket and Token bucket algorithms in details.
3	A. Write the difference between IPV4 and IPV6 B. Explain the IP addressing with subnet masking. C. A sender needs to send 4 data items OX3456, OXABCC, OX02BC and OXEEEE. Answer the followings: a. Find the checksum at the receiver site if the second data item is changed to OXABCE and the third data item is changed to OX02BA b. Find the checksum at receiver site if there is no error
4	A. What is the difference between network layer and transport layer? B. List any 3 differences between UDP and TCP protocol.
5	A. Explain HTTP header. B. Explain SMTP header

Assessment Methodology:

1. Assignments one from each unit.
2. Midterm subjective paper where they have to write algorithms to perform different operations on different data structures as mentioned in the modules. (Twice during the semester)
3. Final paper at the end of the semester subjective.

Teaching and Learning resources unit-wise:

Unit-1

Teaching and Learning Materials:

1. https://www.javatpoint.com/computer-network-topologies
2. https://www.javatpoint.com/computer-network-tutorial
3. https://www.javatpoint.com/computer-network-models
4. https://www.javatpoint.com/osi-model
5. https://www.javatpoint.com/computer-network-tcp-ip-model
6. https://www.javatpoint.com/computer-network-digital-transmission
7. https://www.javatpoint.com/transmission-media
8. https://www.javatpoint.com/guided-transmission-media

Problem Solving:

1. https://www.youtube.com/watch?v=81n3arf3FOw

Unit-2

Teaching and Learning Materials:

1. https://www.javatpoint.com/data-link-layer
2. https://www.javatpoint.com/computer-network-error-detection
3. https://www.javatpoint.com/computer-network-error-correction
4. https://www.javatpoint.com/data-link-controls

Unit-3

Teaching and Learning Materials:

1. https://www.javatpoint.com/network-layer
2. https://www.javatpoint.com/network-addressing
3. https://www.javatpoint.com/computer-network-routing
4. https://www.javatpoint.com/network-layer-protocols

Problem Solving:

1. https://www.youtube.com/watch?v=bCbkIJwjvtI
2. https://www.youtube.com/watch?v=0-andtjj31w

Unit-4

Teaching and Learning Materials:

1. https://www.javatpoint.com/computer-network-transport-layer
2. https://www.javatpoint.com/computer-network-transport-layer-protocols
3. https://www.geeksforgeeks.org/leaky-bucket-algorithm
4. https://www.javatpoint.com/tcp-vs-udp
5. https://www.javatpoint.com/ipv4-vs-ipv6

Unit-5

Teaching and Learning Materials:

1. https://www.javatpoint.com/computer-network-application-layer
2. https://www.javatpoint.com/computer-network-client-and-server-model
3. https://www.javatpoint.com/computer-network-dns
4. https://www.javatpoint.com/computer-network-ftp
5. https://www.javatpoint.com/computer-network-telnet
6. https://www.javatpoint.com/simple-mail-transfer-protocol
7. https://www.javatpoint.com/simple-network-management-protocol
8. https://www.javatpoint.com/computer-network-http

Previous Year Question Papers:

4E1217

4E1217

B. Tech. IV - Sem. (Back) Exam., Oct.-Nov. - 2020
Computer Science & Engineering
4CS4 – 07 Communication and Computer Networks
CS, IT

Time: 2 Hours

Maximum Marks: 82
Min. Passing Marks: 29

Instructions to Candidates:

Attempt all ten questions from Part A, four questions out of seven questions from Part B and two questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL_____   2. NIL_____

PART – A

<u>(Answer should be given up to 25 words only)</u>   [10x2=20]

<u>All questions are compulsory</u>

Q.1 Why are protocols needed?   [2]

Q.2 What is the difference between Network Layer and Transport Layer?   [2]

Q.3 What is peer – to – peer process?   [2]

Q.4 Name three types of Transmission Impairments.   [2]

Q.5 The period of a signal is 100 ms. What it its frequency in kilohertz? [2]

Q.6 Define piggy backing and its usefulness/   [2]

Q.7 What is NAT?   [2]

Q.8 What is the broadcast address for Ethernet?   [2]

Q.9 What are cookies?   [2]

Q.10 Explain types of errors.   [2]

PART - B

Q.1 Write the difference between UDP and TCP.   [8]

Q.2 What is topology? Explain types of topology with suitable diagram.   [8]

Q.3 We measure the performance of a telephone line (4 kHz of bandwidth). When the signal is 20V, the noise is 6 mV. What is the maximum data rate supported by this telephone line?   [8]

Q.4 Write short notes on –   [2×4=8]

   (a) Go – Back – N ARQ

   (b) CSMA/ CD

Q.5 Explain Leaky bucket and Token bucket algorithm in detail.   [8]

Q.6 Write short notes on – https://www.rtuonline.com   [2×4=8]

   (a) Architecture of WWW

   (b) SMTP

Q.7 What are the differences between OSI model and TCP/IP model?   [8]

PART – C

Q.1 A sender needs to send the four data items OX3456, OXABCC, OX02BC and OXEEEE. Answer the following – [15]

(a) Find the checksum at the sender site.

(b) Find the checksum at the receiver site if there is no error.

(c) Find the checksum at the receiver site if the second data item is changed to OXABCE.

(d) Find the checksum at the receiver site if the second data item is changed to OXABCE and the third data item is changed to OX02BA.

Q.2 Explain the IP addressing with subnet masking. Also write the difference between IPV_4 and IPV_6. [15]

Q.3 What do you understand by Aloha? Explain pure and slotted aloha. A pure aloha network transmits 200-bits frames on a shared channel of 200 kbps. What is the throughput if the system produces 1000 frames per second? [15]

Q.4 Write short notes on – [3×5=15]

(a) DNS

(b) Electronic mail

(c) Sliding window protocol

Q.5 Describe the elements of transport protocols.

[15]

4E1217

4E1217

B. Tech. IV - Sem. (Main) Exam., May - 2019
PCC Computer Science & Engineering
4CS4 – 07 Data Communication and Computer Networks
CS, IT

Time: 3 Hours   **Maximum Marks: 120**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and four questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL _____   2. NIL _____

PART – A

(Answer should be given up to 25 words only)   [10×2=20]
All questions are compulsory

Q.1 List the seven layers of the OSI model.

Q.2 What is difference between analog and digital signals?

Q.3 Differentiate between single-bit error and burst error.

Q.4 Define framing and the reason for its need.

Q.5 Differentiate between IPv4 address and IPv6 address.

Q.6 What is physical address?

Q.7 Differentiate between connectionless and connection-oriented service.

Q.8 Write any two differences between UDP and TCP.

Q.9 What are the two main categories of DNS messages?

Q.10 What are the three FTP transmission modes?
http://www.rtuonline.com

PART – B

(Analytical/Problem solving questions) [5×8=40]
Attempt any five questions

Q.1 Explain TCP/IP model with suitable diagram.

Q.2 What is line coding? Explain its characteristics.

Q.3 Explain block coding with suitable diagrams.

Q.4 Explain Go-back-N ARQ protocol.

Q.5 Explain ARP and RARP address mapping protocols.

Q.6 Explain the services provided by the TCP.

Q.7 Explain the services provided by network security.

PART - C

Q.1 Explain any two functions of each layer in the OSI model.

Q.2 Explain pure ALOHA protocol with suitable diagrams.

Q.3 Explain distance vector routing protocol with suitable example.

Q.4 Explain the leaky bucket algorithm with the help of suitable diagrams.

Q.5 Explain the HTTP protocol with the help of suitable diagrams: