Vision of the Department	To produce a blend of creativity & ethical engineering graduates and making them capable of facing the real life challenges.
Mission of the Department	The mission elements of Computer Science & Engineering Department are: M-1. Inculcating the fundamentals of computer science & engineering and analyzing the engineering problems along with the development of solutions keeping environmental aspects. M-2. To cultivate ability for modern tool usage on ethical grounds to widely solve real life issues. M-3. Building team spirit within the students, creating effecting communication for lifelong learning.

Programme Outcomes

1. To solve complex engineering problems by applying the knowledge of mathematics, algorithms,computing principles.
2. Identify and analyze complex engineering problems and define requirements appropriate for it.
3. To design and impement computer based systems and programs to meet desired needs.
4. To provide valid conclusions by using research based knowledge and research methods.
5. To use modern tools necessary for computing practice.
6. To understand the issues related to society by using reasoning.
7. To understand the issues realted to enviornmetal context for strentheing of engineering solutions.
8. An understanding of ethical responsibility.
9. To work effectively as team member for the accomplishment of goals.
10 To communicate effectively with community and society.
11. to design and develop various project economically with planning.
12. To engage in life-long learning.

PROGRAM EDUCATIONAL OBJECTIVES (PEOS)

PEO: 1 To provide quality computer education to inculcate modern technical skills among the students.

PEO: 2 To cultivate the ability to analyze the demand of software industry for carrying out hands on projects.

PEO: 3 Inculcate direction qualities to work mutually as a team member with effective briefing skills.

		Bachelor of Technology (Computer Science & Engineering)								
		Credit-Based Scheme of Studies/Examination								
		Semester VI (w.e.f. session 2020-2021)								
S. No.	Course Code	Subject	L:T:P	Hours /Week	Credits	Examination Schedule (Marks)				Duration of Exam (Hrs)
						Major Test	Minor Test	Practical	Total	
1	PC-CS-302	Complier Design	3:0:0	3	3	75	25	0	100	3
2	PC-CS-304	Computer Networks	3:0:0	3	3	75	25	0	100	3
3	PEC	Elective-II	3:0:0	3	3	75	25	0	100	3
4	PEC	Elective-III	3:0:0	3	3	75	25	0	100	3
5	OE	Open Elective-I	3:0:0	3	3	75	25	0	100	3
6	PROJ – CS-302	Project-1	0:0:6	6	3	0	40	60	100	3
7	PC-CS-306L	UNIX and Linux Programming Lab	0:0:4	4	2	0	40	60	100	3
8	PC-CS-308L	Computer Networks Lab	0:0:4	4	2	0	40	60	100	3
	Total			29	22	375	245	180	800	

PEC Elective-II	PEC Elective-III
Advanced Computer Architecture: PE-CS-S302	Simulation & Modeling: PE-CS-S310
Distributed Systems: PE-CS-S304	Mobile Computing: PE-CS-S312
Fault Tolerant Computing: PE-CS-S306	Unix & Linux Programming: PE-CS-S314
Ad-Hoc and Sensor Networks: PE-CS-S308	Real Time Systems: PE-CS-S316
OEC Elective-I	
Soft Skills and Interpersonal Communication: OE-CS-302	
Management Information System: OE-CS-304	
Enterprise Resource Planning: OE-CS-306	

Note: Students be encouraged to go to 6-8 weeks' summer internships mandatory during the summerbreak after the completion of sixth semester exams.

The course of both PE & OE will be offered at 1/3rd strength or 20 students (whichever is smaller) of thesection.

PC-CS-302	Complier Design						
Lecture	Tutoria l	Practica l	Credi t	Major Test	Minor Test	Tota l	Time
3	0	0	3	75	25	100	3 Hrs.
Purpose	To introduce complier design concepts and their implementation						
Course Outcomes(CO)							
CO1	To understand the role and designing of a lexical analyzer.						
CO2	To analyze the role and designing of syntax analyzer or parser.						
CO3	To identify the role of semantic analyzer and intermediate code generation.						
CO4	To explore the design importance of optimization of codes and error detection						

UNIT I

Introduction to Language Processing System, Compiling Analysis of the Source Program, Phases of a Compiler, Compiler Construction Tools. Lexical Analysis –Regular Expression, Introduction to Finite Automata and Regular Expression, Conversion of Regular Expression to NFA, Role of Lexical Analyzer, Specification of Tokens.

UNIT II

Syntax Analysis: Role of the Parser, Abstract Syntax Trees, Ambiguity in Context-Free Grammars, Types of Parsing: - Top Down Parsing, Recursive Descent Parsing, LL Parser, Back Tracking, Bottom Up Parsing, SLRParser, Canonical LR Parser, LALR Parser.

UNIT III

Semantic Analysis: Semantic Errors, Attribute Grammar, Synthesized attributes, Static Allocation, Stack Allocation, Heap Allocation, Activation Trees, Symbol Table, Intermediate Code Generation and Code Intermediate languages, Declarations, Assignment Statements, Boolean Expressions, Case Statements, DAG representation of Basic Blocks, A simple Code generator from DAG, Issues in the Design of Code Generator
.

UNIT 1V

Code Optimization and Run Time Environments, Principal Sources of Optimization, Machine-independent Optimization, Machine-dependent Optimization, Optimization of Basic Blocks, Loop Optimization, Peephole Optimization, Introduction to Global Data Flow Analysis, Storage Organization, Static Storage Management, Heap Storage management, Parameter Passing. Error Recovery, Panic mode, Statement mode, Global correction.

Suggested Book:
1. Alfred Aho, Ravi Sethi, Jeffrey D Ullman, "Compilers Principles, Techniques and Tools", PearsonEducation Asia, 2018.
2. Allen I. Holub "Compiler Design in C", Prentice Hall of India, 2003.
3. C. N. Fischer and R. J. LeBlanc, "Crafting a compiler with C", Benjamin Cummings, 2003.
4. V Raghavan , " Principles of Compiler Design", Second Edition, Tata McGraw-Hill, 2018.
5. Henk Alblas and Albert Nymeyer, "Practice and Principles of Compiler Building with C", PHI, 2001.

Kenneth C. Louden, "Compiler Construction: Principles and Practice", Thompson Learning, 200

LECTURE PLAN:

Lectures	Topics
L1	Analysis of the source program, Phases of a compiler,
L2	Cousins of the Compiler, Grouping of Phases, Compiler construction tools.
L3-L4	Lexical Analysis –Regular Expression
L5-L6	Introduction to Finite Automata and Regular Expression
L7	Conversion of Regular Expression to NFA,
L8	Role of Lexical Analyzer, Input Buffering, Specification of Tokens.
L9-L10	Role of the Parser, Writing Grammars,
L11	Symbol Table, Context-Free Grammars,
L12	Top Down Parsing with or without Backtracking,
L13-L14	Recursive Descent Parsing, Non-Recursive Descent Parsing,
L15	SLR Parser, Canonical LR Parser, LALR Parser
L16	Intermediate languages, Declarations,
L17	Assignment Statements, Boolean Expressions, Case Statements
L18	DAG representation of Basic Blocks, A simple Code generator from DAG
L19-L20	Issues in the design of code generator
L21-L22	The target machine , Runtime Storage management
L23	Issues in the design of code generator , Error Handling- Type checking,
L24-L25	Principal Sources of Optimization
L26-L27	Optimization of Basic Blocks, Peephole Optimization, Introduction to Global Data Flow Analysis
L28-L29	Source Language issues, Storage Organization, Static Storage Management
L30-L31	Heap Storage management
L32	Access to non-Local Names,
L33	Parameter Passing

TUTORIAL SHEET-1

1. Draw a block diagram to show phases of compiler.
2. What is context free and context sensitive grammar?
3. Write algorithm to convert NFA to DFA.
4. Explain lexical analyzer.
5. Difference between phases and passes of compiler.

TUTORIAL SHEET-2

1. What are regular expressions?
2. Explain parsing.
3. Describe top down parsing.
4. Explain implementation of lexical analyzer.

TUTORIAL SHEET-3

1. Difference between ambiguous and non-ambiguous grammar.
2. Difference between parse tree and syntax tree.
(7) Comp. Engg-7-175
3. Define LL (1) grammar.
4. Explain syntax errors and lexical errors.

TUTORIAL SHEET-4

1. What is principle of source optimization?
2. Explain global dataflow analysis.
3. What is loop optimization?
4. Short note on register allocation and assignment in code.
5. What is symbol table?

BT-6/M-22   **46165**

COMPILER DESIGN
PC-CS-302A

Time : Three Hours]   [Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

Unit I

1. What necessary steps are followed by the compiler for carrying out the compilation process ? Describe in brief the purpose of each step along with a description of the compiler construction tools used in different steps of compilation.

2. What are the rules and properties of Regular Expressions ? What is the relationship between regular expression, lexial analysis, and finite automata ? What does the regular expression $(a + b)*$ *abb* mean ? Construct NFA for this regular expression.

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Unit II

3. Answer the following questions in brief :

   (a) What is the role of a parser in compilation process ?

   (b) What does ambiguity in a context free grammar mean ?

   (c) How do you represent an abstract syntax tree ?

4. (a) Why are Recursive Descent and LL parsers known as top-down parsers ? How is left recursion eliminated ?

   (b) What is shift-reduced parsing ? Describe how LR parsers use the shift-reduce technique ?

Unit III

5. (a) Is attribute grammar a special case of context free grammar ? Justify. Explain synthesized attributes using an appropriate example.

   (b) Distinguish between Stack allocation and Heap Allocation.

6. (a) Describe in brief the principle ways of organizing and accessing symbol tables.

   (b) What is the significance of generating intermediate code ? Give examples of any *two* intermediate codes used in compilers.

Unit IV

7. What are the types of code optimization ? Describe the ways in which code optimization can be done. Also give suitable example to show how loop optimization can be carried out ?

8. Give brief answers of the following questions :

   (a) How is global data flow analysis used to perform optimization ?

   (b) How does Runtime environment manage runtime memory requirements ?

   (c) Describe any *two* common error-recovery strategies that can be implemented in a parser to deal with errors in the code.

BT-7/D-16
COMPILER DESIGN
CSE-401

Time: Three Hours   [Maximum Marks: 100]

Note: Attempt Five questions in all, selecting at least one question from each Unit.
All questions carry equal marks.

Unit I

1. What are the steps necessary in the construction of a Compiler? Describe the steps in brief. Is symbol table a part of the final code generated? What is the purpose of symbol table management?

2. Consider the grammar:
   E → E+T I T
   T→TE I F
   F F* I a I b
   a) Construct the SLR parsing table.
   b) Construct the corresponding LAIR parsing table.

Unit II

3. What is the role of intermediate code generation in Compiler design? Describe in brief the various kinds of intermediate code often used in Compliers.

4. Compare various symbol table structures with respect to the operations on the tables.

Unit III

5. a) What do you mean by run time storage allocation? Explain the difference between static and dynamic allocations.
   b) What is an activation record? Describe the components of an activation record.

6. What are the sources of errors in a program? Give examples of syntactic errors and describe how syntactic phase errors can be detected.

Unit IV

7. What is the objective of optimizing codes? Give two examples of the kind of optimizations that can be performed in loop.

8. What are the main sources of difficulty in code generation? How is register allocation performed?

PC-CS-304	Computer Networks						
Lecture	Tutorial	Practical	Credit	Major Test	Minor Test	Total	Time
3	0	0	3	75	25	100	3 Hrs.
Purpose	To introduce the architecture and layers of computer network, protocols used at different Layers.						
Course Outcomes(CO)							
CO1	To understand the basic concept of networking, types, networking topologies and layered architecture.						
CO2	To understand data link layer and MAC sub-layer`						
CO3	To understand the network Layer functioning						
CO4	To understand the transport layer and application layer operation						

Unit -I

Introduction to Computer Networks : Data Communication System and its components, Data Flow, Computer network and its goals, Types of computer networks: LAN, MAN, WAN, Wireless and Wired networks, broadcast and point-to-point networks, Network topologies, protocols, interfaces and services, ISO-OSI reference model, TCP/IP architecture.

Physical Layer: Concept of Analog & Digital Signal, Bandwidth, Transmission Impairments: Attenuation, Distortion, Noise, Multiplexing: Frequency Division, Time Division, Wavelength Division, Transmission Media: Twisted pair, Coaxial cable, Fiber optics, Wireless transmission (radio, microwave, infrared),Switching: Circuit Switching, Message Switching, Packet Switching & comparisons, narrowband ISDN, broadband ISDN.

Unit -II

Data link layer: Error Control, Types of errors, framing (character and bit stuffing), error detection & correction methods; Flow control; Protocols: Stop & wait ARQ, Go-Back- N ARQ, sliding window protocols,Selective repeat ARQ, HDLC;

Medium access sub layer: Point to point protocol, FDDI, token bus, token ring; Reservation, polling, Multipleaccess protocols: Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD, FDMA, TDMA, CDMA, LLC, Traditional Ethernet, fast Ethernet, Network devices-repeaters, hubs, switches, Bridges, Router, Gateway.

Unit-III

Network layer: Addressing: Internet address, sub-netting; Routing techniques, static vs. dynamic routing, routing table, DHCP, IEEE standards 802.x, Routing algorithms: shortest path algorithm, flooding, distance vector routing, link state routing; Protocols: ARP, RARP, IP, ICMP, IGMP, IPV6; Unicast and multicast routing protocols, ATM.

Unit-IV

Transport layer: Process to process delivery; UDP; TCP, RPC, Congestion control algorithm: Leaky bucketalgorithm, Token bucket algorithm, choke packets; Quality of service: techniques to improve QoS. **Application layer**: DNS; SMTP, SNMP, FTP, HTTP & WWW; Firewalls, Bluetooth, Email, S/MIME, IMAP,**Network Security**: Cryptography, user authentication, security protocols in internet, public key encryptionalgorithm, digital signatures

Suggested Books:
1.   Behrouz A. Forouzan, "Data communication and Networking", Tata McGraw Hill, Fourth Edition,2011.
2.   Computer Networks, 4th Edition, Pearson Education by Andrew S. Tanenbaum
1.   Larry L.Peterson, Peter S. Davie, "Computer Networks", Elsevier, Fifth Edition, 2012.
2.   William Stallings, "Data and Computer Communication", Eighth Edition,Pearson Education, 2007.
3.   James F. Kurose, Keith W. Ross, "Computer Networking: A Top–Down Approach Featuring theInternet", Pearson Education, 2005.

LECTURE PLAN:

Lectures	Topics
L1	Data Communication System and its components, Data Flow, Computer network and its goals
L2	Types of computer networks: LAN, MAN, WAN, Wireless and Wired networks, broadcast and point-to-point networks
L3-L4	Network topologies, protocols, interfaces and services, ISO-OSI reference model, TCP/IP architecture.
L5-L6	**Physical Layer**: Concept of Analog & Digital Signal, Bandwidth, Transmission Impairments: Attenuation, Distortion, Noise
L7	Multiplexing : Frequency Division, Time Division, Wavelength Division
L8	Transmission Media : Twisted pair, Coaxial cable, Fiber optics
L9-L10	Wireless transmission (radio, microwave, infrared),Switching: Circuit Switching, Message Switching
L11	Packet Switching & comparisons, narrowband ISDN, broadband ISDN.
L12	Error Control, Types of errors, framing(character and bit stuffing)
L13-L14	error detection & correction methods; Flow control; Protocols: Stop & wait ARQ , Go-Back- N ARQ
L15	sliding window protocols,Selective repeat ARQ, HDLC;
L16	Point to point protocol, FDDI, token bus, token ring; Reservation
L17	polling, Multipleaccess protocols: Pure ALOHA,
L18	Slotted ALOHA, CSMA, CSMA/CD, FDMA
L19-L20	TDMA, CDMA, LLC,Traditional Ethernet, fast Ethernet, Network devices-repeaters, hubs, switches, Bridges, Router, Gateway.
L21-L22	Addressing: Internet address, sub-netting; Routing techniques, static vs. dynamic routing, routing table, DHCP, IEEE standards 802.x
L23	Routing algorithms: shortest path algorithm, flooding,
L24-L25	distance vector routing, link state routing; Protocols: ARP, RARP, IP, ICMP, IGMP, IPV6; Unicast and multicast routing protocols
L26-L27	ATM, Process to process delivery; UDP; TCP, RPC, Congestion control algorithm: Leaky bucketalgorithm
L28-L29	Token bucket algorithm, choke packets; Quality of service: techniques to improve QoS. **Application layer**: DNS; SMTP
L30-L31	SNMP, FTP, HTTP & WWW; Firewalls, Bluetooth, Email, S/MIME,
L32	IMAP,**Network Security**: Cryptography, user authentication, security protocols in internet
L33	public key encryptionalgorithm, digital signatures

TUTORIAL SHEET

UNIT-I

1: What do you mean by Data Communication System and its components?
2: What are the different types of network topology?
3: What is ISO-OSI reference model, TCP/IP architecture.
4: What is Switching: Circuit Switching, Message Switching, Packet Switching?
5: What is Multiplexing: Frequency Division, Time Division, Wavelength Division?

UNIT-II

1: What do you mean by error detection & correction methods?
2: What are different Protocols: Stop & wait ARQ, Go-Back- N ARQ?
3: FDDI, token bus, token ring.
4: Multiple access protocols: Pure ALOHA, Slotted ALOHA.
5: Explain FDMA, TDMA, CDMA?
6: Network devices-repeaters, hubs, switches, Bridges, Router, Gateway?

UNIT-III

1: What do you mean by addressing. Explain Internet address, subnetting?
2: Routing techniques, static vs. dynamic routing, routing table
3: IEEE standards 802.x,

4: Routing algorithms: shortest path algorithm, flooding, link state routing;
5: Protocols: ARP, RARP, IP, ICMP, IGMP
6: Unicast and multicast routing protocols.

UNIT-IV

1: Explain UDP; TCP, RPC,
2: Congestion control algorithm: Leaky bucket algorithm, Token bucket algorithm
3: Write a short note on techniques to improve QoS.
4: SMTP, SNMP, FTP, HTTP & WWW;
5: Firewalls, Bluetooth
6: Security: Cryptography, user authentication, public key encryption algorithm, digital signatures.

BT-6/J-22   46166

COMPUTER NETWORKS
PC-CS-304E

Time : Three Hours]   [Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit.

Unit I

1. (a) What are the advantages that packet switching have over circuit switching ?   6

   (b) Explain TDM, FDM, WDM, TDMA and FDMA along with unique advantages and features of each.

         9

2. (a) Consider a 3 kHz channel with 8-level signaling. Obtain and compare bit rate to channel capacity at 20 dB SNR.   9

   (b) Explain different types of transmission media and their advantages.   6

Unit II

3. (a) In a LAN, which MAC protocol has a higher efficiency : ALOHA or CSMA-CD ? Justify your answer.   9

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(b) Why framing is required ? Explain any *two* framing methods with example. 6

4. (a) Explain, how error is detected and corrected in digital transmission ? 9

(b) Give the differences between *p*-persistent, 1-persistent and non-persistent CSMA-CD. 6

Unit III

5. (a) What are private IP address ranges ? Why private IP addresses are needed ? What is the advantage of subnetting ? 9

(b) Describe the working of DHCP and ARP. 6

6. (a) Describe various uses of ICMP. 9

(b) Explain the differences between distance vector and link state routing. 6

Unit IV

7. (a) TCP uses a three-way handshake for connection setup. Explain, why TCP does not use to two-way handshake ? What extra functionality is gained in a three-way handshake that is not possible with a two-way handshake ? 9

(b) Explain the importance of user authentication, integrity and crytography. 6

8. (a) Explain the working of SNMP. Describe any *three* message types out of several available in SNMP. 9

(b) What is the difference between leaky bucket and token bucket algorithms ? Discuss the two algorithms. 6

PE-CS-S308			Mobile Ad-hoc and Wireless Sensor Networks				
Lecture	Tutorial	Practical	Credit	Major Test	Minor Test	Total	Time
3	0	0	3	60	40	100	3 Hrs.
Program Objective (PO)	To enable students to describe and deal with computer communication and networking, variousreference models and architectures along with implemented wireless communication techniques and various security and privacy parameters are also studied.						
Course Outcomes (CO)							
After completion of course students will be able to							
CO1	Classify traditional networks and discuss various wireless networking standards, compare and contrast various IEEE wireless LAN and Ethernet standards.						
CO2	Describe cellular architecture and IPv4 and IPv6 header formats has to be discussed along with mobile IP.						
CO3	Recently deployed high performance computing standards, VPN, routing protocols as to be gone through.						
CO4	Various security and privacy standards/tools to be described.						

Unit I

Introduction to Mobile Ad hoc Networks (MANET) – Mobility Management, Characteristics and Attributes related to MANETs, Modeling distributed applications for MANET, MAC mechanisms and protocols.

Unit II

MANET Routing Protocols: Ad hoc network routing protocols, destination sequenced distance vector algorithm, cluster based gateway switch routing, global state routing, fish-eye state routing, dynamic source routing, ad hoc on-demand routing, OLSR & TORA routing, location aided routing, zonal routingalgorithm.

Unit III

Ad-Hoc Network Security: Link layer, Network layer, Trust and key management. Self policing MANET
– Node Misbehaviour, secure routing, reputation systems.
Wireless Sensor Networks (WSN) : Design Issues, Clustering, Applications of WSN.

Unit IV

MAC layer and Routing Protocols in WSN
Data Management: Retrieval Techniques in WSN, Sensor databases, distributed query processing, Datadissemination and aggregation schemes, Operating Systems for WSN, Security issues in WSN.

Suggested Books:
1   C. Siva Ram Murthy & B.S. Manoj, Mobile Ad hoc Networks – Architectures & Protocols, PearsonEducation, New Delhi, 2004
2   C M Cordeiro& D.P. Agrawal, Adhoc & Sensor Networks – Theory and Applications, ISBN 981256-682-1, World Scientific Singapore, 2006
3   C. S. Raghvendra, Wireless Sensor Networks, Springer-Verlag, 2006.

Lecture Plan

Lecture	Topic
L1	What is ad-hoc network and MANET
L2	Mobility Management
L3	Characteristics and Attributes related to MANETs
L4	Modelling distributed applications for MANET
L5	MAC mechanisms and protocols
L6	Ad hoc network routing protocols
L7	destination sequenced distance vector algorithm
L8	cluster based gateway switch routing
L9	global state routing,
L10	fish-eye state routing
L11	dynamic sourcerouting,
L12	ad hoc on-demand routing
L13	OLSR & TORA routing
L14	Location aided routing
L15	zonal routing algorithm
L16	Link layer Trust and key management
L17	Network layer Trust and key management
L18	Network layer Trust and key management
L19	Self-policing MANET– Node Misbehaviour
L20	secure routing
L21	reputation systems.
L22	Design Issues
L23	Clustering
L24	Applications of WSN
L25	MAC layer and Routing Protocols in WSN
L26	Retrieval Techniques in WSN
L27	Sensor databases
L28	distributed query processing
L29	Data dissemination
L30	Data aggregation schemes
L31	Operating Systems for WSN
L32	Security issues in WSN

Tutorial Sheet-1

1. What is MANET? Different characteristics and applications of MANET?
2. What are the modelling distributed applications for MANET?
3. Explain MAC protocols?

Tutorial Sheet-2

1. Explain different Ad-hoc network routing protocols?
2. Differentiate fish-eye state routing and dynamic sourcerouting?
3. Explain ad hoc on-demand routing dynamic sourcerouting?

Tutorial Sheet-3

1. Explain Link layer, Network layer, Trust and key management?
2. What are Design Issues?
3. What are the different Applications of WSN?

Tutorial Sheet-4

1. What are different Retrieval Techniques in WSN?
2. What are Datadissemination and aggregation schemes?
3. Explain different Security issues in WSN?

Roll No. .1.2.1.9.2.5.9.....   Total Pages : 03

BT-6/J-22   46170

MOBILE AD-HOC AND WIRELESS
SENSOR NETWORKS

PE-CS-S308A

Time : Three Hours]   [Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting at least *one*
question from each Section

Section I

1. (a) What are the security threats in a MANET ? What
         are the factors responsible for limited security in
         MANETs ?   10

    (b) For every layer of MANET protocol stack, show at
         least one type of security attack that exploits
         vulnerability at that layer.   5

2. (a) List the applications of MANET.   5

    (b) For every layer of MANET protocol stack, show at
         least one type of security attack that exploits
         vulnerability at the layer.   10

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(b) Is spread spectrum modulation schemes are followed in WSN ? Justify your answer. 8

8. (a) Explain any *three* scheduled based MAC protocols of WSN. 7

(b) How localization and QoS are done in WSN ? 8

Section II

3. (a) Illustrate the classification of unicast MANET Routing Protocols. 10

(b) Explain, how multicast routing is carried out in ad-hoc networks ? 5

4. (a) Explain the functioning of destination sequenced distance vector algorithm. 7

(b) Explain in detail the ad hoc on-demand routing protocol. 8

Section III

5. (a) Explain the concept of Self Policing MANET and Node Misbehaviour. 8

(b) Explain the concept of secure routing and reputation systems. 7

6. (a) Explain in detail the Link layer for Ad-hoc Network Security. 7

(b) Write about the energy efficient routing in WSN. 8

Section IV

7. (a) With required diagram explain the single node hardware and software architecture of WSN. 7

PE-CS-S312	Mobile Computing						
Lecture	Tutorial	Practical	Credit	Major Test	Minor Test	Total	Time
3	0	0	3	75	25	100	3 Hrs.
Purpose	To impart knowledge of mobile and wireless computing systems and techniques.						
Course Outcomes(CO)							
CO1	Describe the concepts of mobile computing and cellular networks.						
CO2	Learn the basic concepts of wireless networks.						
CO3	Study of various issues of mobile computing and basics of cloud computing.						
CO4	Description and applications of Ad hoc networks.						

UNIT – I
Introduction, Issues in mobile computing, Overview of wireless telephony: cellular concept- Cell, Co- Channel Interference, Frequency reuse, HLR-VLR, handoffs, channel allocation in Cellular systems, Mobile computing Architecture, Design considerations for mobile computing, Mobile Computing throughInternet, Making existing applications mobile enabled, 3G, 4G.

UNIT – II
Wireless Networking, Wireless LAN Overview: MAC issues, IEEE 802.11, Bluetooth, Wireless multiple access protocols, TCP over wireless, Wireless applications, data broadcasting, Mobile IP, WAP : Architecture, Traditional TCP, Classical TCP, improvements in WAP, WAP applications.

UNIT – III
Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless networks, File system, Disconnected operations Mobile Agents computing, security and fault tolerance, transaction processing in mobile computing environment.
Cloud Architecture model, Types of Clouds: Public Private & Hybrid Clouds, Resource management and scheduling, Clustering, Data Processing in Cloud: Introduction to Map Reduce for Simplified dataprocessing on Large clusters.

UNIT – IV
Ad hoc networks, Manet's & its Applications, Routing & Routing protocols- Global state routing (GSR), Destination sequenced distance vector routing (DSDV), Dynamic source routing (DSR), Ad Hoc on demand distance vector routing (AODV), Temporary ordered routing algorithm (TORA), Fish eye routingprotocol, QoS in Ad Hoc Networks.

Suggested Books:
1. Rajkamal, Mobile Computing, 2/E Oxford University Press,2011.
2. J. Schiller, Mobile Communications, Addison Wesley
3. Yi Bing Lin, Wireless and Mobile Networks Architecture , John Wiley.
4. M. V. D. Heijden, M. Taylor, Understanding WAP, Artech House.
5. Charles Perkins, Mobile IP, Addison Wesley.
6. Charles Perkins, Ad hoc Networks, Addison Wesley.
7. Judith Hurwitz, Robin Bllor, Marcia Kaufmann, Fern Halper, Cloud Computing for Dummies,2009.

LECTURE PLAN

Lectures	Topics
L1	Introduction, issues in mobile computing,
L2	overview of wireless telephony: cellular concept, Mobile computing Architecture, Design considerations for mobile computing,
L3-L4	Mobile Computing through Internet, Making existing applications mobile enabled
L5-L6	GSM: air-interface, channel structure
L7	location management: HLR-VLR, hierarchical, handoffs,
L8	channel allocation in Cellular systems
L9-L10	WCDMA, GPRS 3G, 4G
L11	Wireless Networking, Wireless LAN Overview: MAC ISSUES
L12	IEEE 802.11, Blue Tooth,
L13-L14	Wireless multiple access protocols, TCP over wireless,
L15	Wireless applications, data broadcasting,
L16	Mobile IP, WAP : Architecture,
L17	Traditional TCP, Classical TCP,
L18	issues improvements in WAP, WAP applications
L19-L20	Data management issues, data replication for mobile computers,
L21-L22	adaptive clustering for mobile wireless networks, File system, Disconnected operations
L23	Mobile Agents computing, security and fault tolerance, transaction processing in mobile computing environment.
L24-L25	Cloud Architecture model, Types of Clouds: Public Private & Hybrid Clouds, Resource management and scheduling,
L26-L27	Clustering, Data Processing in Cloud: Introduction to Map Reduce for Simplified data processing on Large clusters.
L28-L29	Ad hoc networks, localization, MAC issues,
L30-L31	Routing protocols, global state routing (GSR),
L32	Destination sequenced distance vector routing (DSDV),
L33	Dynamic source routing (DSR),
L34	Ad Hoc on demand distance vector routing (AODV), Temporary ordered routing algorithm (TORA)
L35-L36	QoS in Ad Hoc Networks, applications.

TUTORIAL SHEET-1

1. Explain the challenges in mobile computing?
2. Explain in detail the cellular architecture with its frequency reuse factors?
3. Describe the various methods used in cell splitting to increase the capacity?
4. Write short note on
   a) CDMA   b) FDMA   c) TDMA   d) GSM
5. Describe the mobility management by using hand off strategy?

TUTORIAL SHEET-2

1. Explain mobile IP and cellular IP?
2. Describe data delivery models?
3. Explain broadcast and broadcast birds?
4. A) Distributed file sharing for mobility support
   B) CODA
5. Explain directory service in air?

TUTORIAL SHEET-3

1. What do you mean by Ad Hoc network protocols?
2. Explain DSDV algorithm?
3. Explain global state routing, fish eye routing and dynamic source routing?
4. What are switches?
5. Explain Zonal routing algorithm?

TUTORIAL SHEET-4

1. How transactions are done in mobile?
2. What are Kangaroo and Joey transactions?
3. How the electronic payment is done?
4. What are the protocols for mobile commerce?

Roll No. ..1219.25.9...   Total Pages : 02

BT-6/J-22   46172

MOBILE COMPUTING
PE-IT-S312A/PE-CS-S312A

Time : Three Hours]   [Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit.

Unit I

1. (a) Explain evolution of mobile systems and design considerations for mobile computing.   9

   (b) What is hand-off ? Explain various types and issues therein.   6

2. (a) Explain the concept of HLR and VLR.   6

   (b) Explain the four sub-systems of GPRS system architecture. What are protocol layers between BSS and SGSN in GPRS ?   9

Unit II

3. (a) Explain the working IEEE802.11 MAC.   7

   (b) What are different entities in mobile IP ? Show various types of encapsulation done here.   8

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4. (a) What is WAP ? Describe WAP protocol stack and its architecture. 8

   (b) Why cannot we use TCP directly over wireless. Suggest some improvements. 7

Unit III

5. (a) Explain the need of data replication for mobile computers. 7

   (b) Discuss resource management, scheduling and load balancing in cloud. 8

6. (a) What are issues in mobile transaction processing ? 7

   (b) Explain the need of map reduce for simplified data processing. 8

Unit IV

7. (a) What are the concepts in reactive and proactive routing protocols in MANET ? 9

   (b) Explain the working of DSR. 6

8. (a) What is the reason of AODV protocol being immensely popular ? Discuss. 9

   (b) What are challenges in MANET routing protocols ? 6

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Mobile Computing
Paper: CSE-302

Time: 3 hrs   **M.M. :100**
NOTE: Attempt five questions in all, selecting at least one question from each section. Write answer to the point only. Every question has equal importance. All the parts of a question must be attempted together.

Section-A

1. a) The HLR is a centralized database, which may become bottleneck during heavy traffic. Design a distributed HLR architecture to resolve this problem.
    b) Existing cellular system utilize two level database structures (i.e., HLR and VLR) to support roaming management. Is it appropriate to implement a cellular system with a single level database structure?
2. If a total of 33 MHz of bandwidth is allocated to a particular FDD cellular telephone   system which uses to 25 KHz simplex channels to provide full duplex voice and control channels, compute the number of channels available per cell if a system uses (i)four-cell re-use,(ii) seven-cell reuse and (iii)twelve-cell reuse. If 1MHz of the allocated spectrum is dedicated to control channels, determine an equitable distribution of control channels and voice channels in each cell for each of the three systems?

<div align="center">OR</div>

   a) What is soft handoff? How new channels can be added in soft handoff?
   b) What is Hierarchical location management scheme. Discuss.

Section-B

3. a) Write algorithm for determining optimal bandwidth allocation between on demand and broadcast channel.
    b) What is general architecture of Mobile File System. Discuss its components in brief.
4. a) What are the problems with Callback invalidation scheme in mobile computing   environment? Give suitable example in support of your answer.
    b) What is Broadcasting timestamp scheme? Give suitable example in support of your answer.

Section-C

5. a) What is Ad hoc On Demand Distance Vector(AOD) protocol? Discuss with the help of suitable example.
    b) What are the advantages and disadvantages in using AODV protocol?
6. a) What is Destination Sequenced Distance Vector(DSD) Algorithm? Discuss with the help   of suitable example.
    b) What is Routing? How is the traffic routed in the class based gateway routing switch routing protocol? Give suitable example in support of your answer.

Section-D

7. a) What is Team Transaction? Discuss its different components.
    b) Draw General Mobile transaction recovery model. Explain different components.
8. a) What is Mobile Transaction? Discuss with the help of suitable example.
    b) What is Reference model of Mobile transaction system? Discuss different components of the model.

OE-CS-304	Management Information System						
Lecture	Tutorial	Practical	Credit	Major Test	Minor Test	Total	Time
3	0	0	3	75	25	100	3 Hour
Purpose	To familiarize the students with Management Information System.						
	Course Outcomes						
CO1	Understand and articulate fundamental concepts of information technology management.						
CO2	Assess and apply IT to solve common business problems.						
CO3	Suggest and defend effective solutions to business problems, and design a database application to solve a business problem.						
CO4	Discuss the ethical aspects of information technology use in the organization and itsgovernance issues.						

UNIT I

Introduction: Definition information system, role and impact of MIS, The challenges of Information system, Nature of
MIS, Characteristics of MIS, Myths regarding MIS, Requirements of MIS, Problems & Solutions in implementing MIS, Benefits of MIS, Limitations of MIS, Significance of MIS, Components of MIS. Roleof MIS, Major Management challenge to building and using information system in Organization, functionsof management.

UNIT II

Information system and Organizations: The relationship between Organization and Information System,Information needs of different organization levels: Information concept as quality product, classification and value of information, methods of data and information collection. Strategic role of information system,Salient features of Organization, Information, management and decision making, How Organization affect Information Systems, How Information system affect Organization, Ethical and Social impact of information system.

UNIT III

Business application of Information System: Foundation Concepts Information systems in Business: Information system and technology, Business Applications, Development and Management. The internetworked E-business Enterprise: Internet, and Extranet in business. Electronic Commerce System: Electronics commerce Fundamentals, Commerce Application and issues. E-business Decision Support: Decision support in E-Business, Artificial Intelligence Technologies in business.

UNIT IV

Technical Foundation of Information System: Computers and information processing, Computer Hardware, Computer software, Managing data resources, Telecommunication, Enterprise: wide computingand networking.
Strategic and Managerial Implications of Information Systems: Strategic Information System: Introduction, Characteristics of Strategic Information Systems, Strategic Information Systems (SISP), Strategies for developing an SIS, Potential Barriers to developing a Strategic Information System (SIS), Decision Support System (DSS): Decision making concepts, methods, tools and

procedures. Managing Information Resources: Introduction, IRM, Principal of Managing Information Resources, IRM functions, Computer Security: Introduction, Computer Security, Types of Computer Security, Disaster Recovery Plan.

Suggested Books:
1. W.S . Jawadakar, "Management Information System", McGraw Hill ☐ J. O. Brien, " Management Information System", TMH, New Delhi
2. Uma G . Gupta, "Management Information System" Fifth Edition TMH.
3. Kenneth C. Laudon, "Management Information System Organisation and Technology" TMH

LECTURE PLAN:

Lectures	Topics
L1	Definition information system, role and impact of MIS, The challenges of Information system, Nature of MIS
L2	Characteristics of MIS, Myths regarding MIS, Requirements of MIS, Problems & Solutions in implementing MIS
L3-L4	Benefits of MIS, Limitations of MIS, Significance of MIS, Components of MIS. Roleof MIS,
L5-L6	Major Management challenge to building and using information system in Organization, functionsof management.
L7	Conversion of Regular Expression to NFA, The relationship between Organization and Information System
L8	Information needs of different organization levels: Information concept as quality product
L9-L10	classification and value of information, methods of data and information collection. Strategic role of information system,Salient features of Organization
L11	Information, management and decision making, How Organization affectInformation Systems
L12	Salient features of Organization, Information, management and decision making,
L13-L14	How Organization affect Information Systems, How Information system affect Organization, Ethical and Social impact of information system.
L15	Foundation Concepts Information systems in Business: Information system and technology
L16	Business Applications, Development and Management.
L17	The internetworked E-business Enterprise: Internet, and Extranet in business.
L18	Electronic Commerce System: Electronics commerce Fundamentals, Commerce Application and issues
L19-L20	E-business Decision Support: Decision support in E-Business, Artificial Intelligence Technologies in business
L21-L22	Computers and information processing, Computer Hardware, Computer software
L23	Managing data resources, Telecommunication, Enterprise: wide computing and networking.
L24-L25	Strategic Information System: Introduction, Characteristics of Strategic Information Systems ,Strategic Information Systems (SISP)
L26-L27	Strategies for developing an SIS, Potential Barriers to developing a Strategic Information System (SIS)
L28-L29	Decision Support System (DSS): Decision making concepts, methods, tools and procedures.
L30-L31	Managing Information Resources: Introduction, IRM, Principal of Managing Information Resources
L32	IRM functions,Computer Security: Introduction, Computer Security,
L33	Types of Computer Security, Disaster Recovery Plan

TUTORIAL SHEET 1

Q1. Define MIS and also discuss its characteristics.
Q2. Discuss various components of MIS
Q3. What is the role and impact of MIS?
Q4. What are the problems encountered in MIS? How can we solve these problems?

TUTORIAL SHEET 2

Q1. Briefly discuss the information needs of different organization levels.
Q2. What are the salient features of organization, information, management and decision making?
Q3. Explain in detail the ethical and social impact of information system.
Q4. Describe various methods of data and information collection.

TUTORIAL SHEET 3

Q1. How Information system play a pivotal role in Business development & management?
Q2. What is internetworked E-business Enterprise & explain usage of Internet, and Extranet in business
Q3. Explain various Artificial Intelligence Technologies in business.
Q4. Discuss in brief implications of Electronic Commerce System.

TUTORIAL SHEET 4

Q1. Define wide computing and networking
Q2. What are the characteristics of Strategic Information Systems?
Q3. Explain various potential barriers to developing a Strategic Information System
Q4. Briefly discuss decision making concepts, methods, tools and procedures.

Roll No. 1219259

Total Pages : 03

BT-6/M-22   46176

MANAGEMENT INFORMATION SYSTEM
OE-CS-304A

Time : Three Hours]   [Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit I to Unit IV. All questions carry equal marks.

Unit I

1. What is the role and impact of Management Information System (MIS) ? Discuss the myths regarding MIS. Elaborate the problems identified and solution recommended for implementing MIS.   15

2. Explain the components of MIS. How is MIS significant for an organization ? Discuss management issues/ challenges for building an information system in an organization.   15

Unit II

3. What is meant by data and information ? List the kinds of information required at executive level. Discuss the limitations of data collection methods that influence the quality of information as a product.   15

4. Write the salient features of an organization. How transaction cost theory of the impact of information system affects organizations ? What are the ethical impact of information system ?   15

Unit III

5. Elaborate the role of technology to build an effective information system for a business. Differentiate between internet, intranet and extranet. How artifical intelligence technology may be helpful for a business ?   15

6. Define e-Commerce. How e-Commerce is different from e-Business ? Discuss potential applications of e-Commerce and its supports for decision making capabilities in e-Business.   15

Unit IV

7. (a) What is meant by computer hardware and software ? Discuss utility programs and application softwares.

   (b) Elaborate the different types of computer securities.
   8+7=15

8. (a) Discuss the characteristics of Strategic Information System (SIS). Write the potential barriers for developing a SIS.

   (b) Explore the functions and principles of managing information resources.   8+7=15

PC-CS-306L	UNIX and Linux Programming Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**Minor Test**	**Practical**	**Total**	**Time**
0	**0**	**4**	**3.0**	**40**	**60**	**100**	**3 Hrs.**
Purpose	Experimental knowledge of programming skills with expertisation on Unix/Linux platform						
Course Outcomes(CO)							
CO1	Learning of simple and advanced commands of Unix /Linux operating systems.						
CO2	Develop shell programming using Bash or any other shell scripts.						
CO3	Develop advanced shell programming skills.						
CO4	Analyzing & evaluation of performance of various c language based programs with the helpof Make file & debug utilities.						
CO5	Creation of user accounts, Learning of package installation, backup and shutdown process on Unix /Linux operating systems.						

List of Practical

1. Familiarize with Unix/Linux Log In/Log Out and various other commands & vi editor.
2. Develop simple shell programs using Bash or any other shell in Linux.
3. Develop advanced shell programs using grep, fgrep & egrep.
4. Compile and debug various C language based programs using 'makefile' & 'debug' utility.
5. Learning of installation of dual operating systems with Linux having previously installed otherwindow based operating system. Both OSs should be in working operating mode.
6. As Supervisor create and maintain user accounts, learn package installation, taking backups, creation ofscripts for file and user management, creation of startup and shutdown scripts using at, batch, cron etc.

NOTE : At least 8 to 12 more programs exercises based on Unix/Linux platform are to beassigned by the concerned teacher.

PC-CS-308L	Computer Networks Lab						
Lecture	Tutorial	Practical	Credit	Minor Test	Practical	Total	Time
0	0	4	2	40	60	100	3 Hour
Purpose	To explore networking concepts using Java programming & networking tools.						
Course Outcomes (CO)							
CO1	Do Problem Solving using algorithms.						
CO2	Design and test simple programs to implement networking concepts using Java.						
CO3	Document artifacts using applied addressing & quality standards.						
CO4	Design simple data transmission using networking concepts and implement.						

COMPUTER NETWORKS LAB

1. Create a socket for HTTP for web page upload and download.
2. Write a code simulating ARP /RARP protocols.
3. Study of TCP/UDP performance.
4. Performance comparison of MAC protocols
5. Performance comparison of routing protocols.
6. Write a program:
   a. To implement echo server and client in java using TCP sockets.
   b. To implement date server and client in java using TCP sockets.
   c. To implement a chat server and client in java using TCP sockets.
7. Write a program:
   a. To implement echo server and client in java using UDP sockets
      To implement a chat server and client in java using UDP sockets.
   b. To implement a DNS server and client in java using UDP sockets.
8. To flood the server from a spoofed source address leading to a DoS attack.
9. To sniff and parse packets that pass through using raw sockets.
10. To implement simple calculator and invoke arithmetic operations from a remote client.
11. To implement bubble sort and sort data using a remote client.
12. To simulate a sliding window protocol that uses Go Back N ARQ