

## COMPUTER NETWORK

- Q1. What is the hexadecimal address of the ipaddress 192.41.6.20 ?  
(A) 192CB (B) CBA 5 (C) C0290614 (D) C498
- Q2. Which of the following protocols are connection oriented ?  
(A) UDP (B) TCP (C) SMTP (D) ICMP
- Q3. Television channels are 6 M Hz wide. How many bits/sec can be sent if four-level digital signal is used. Assume the channel is noiseless  
(A) 30 Mbps (B) 12 Mbps (C) 20 Mbps (D) 24Mbps
- Q4. If a message has 20 bits word, then determines the smallest number of redundant bits required to detect and correct 1 bit error.  
(A) 5 (B) 10 (C) 34 (D) 23
- Q5. Which of the following routing algorithms can land in count to infinity problem?  
(A) Flooding (B) Selective flooding (C) Goback N (D)Distance vector.
- Q6. For class C network subnetting, how many bits I has to borrow from host part to network part, so that each subnet shall support at most two computers only.  
(A) 6 (B) 60 (C) 10 (D) 4
- Q7. If a signal consists of 16 discrete levels and is transmitted over a noise less channel of band width 3-kHz. Then determine maximum allowable data rate of the channel.  
(A) 24000 bps (B) 30 KHZ (C) 2 MB (D) 3 GB
- Q8. A system has n-layer protocol hierarchy. Applications generate message of length M bytes. At each of the layers, an h-bytes header is added. What fraction of bandwidth is filled with header ?  
(A) Mn (B) nh/(nh+M) (C) 2M (D) 2n
- Q9. What is the size of an ATM cell?  
(A) 53 octets (B) 23 octets (C) 34 octets (D) 100 Mhz
- Q10. Slow start and Fast recovery is a congestion management policy corresponds to which of the following protocol?  
(A) UDP (B) SMTP (C) TCP (D) http
- Q11. For TCP termination procedure how many messages are exchanged between sender and receiver?  
(A) 4 (B) 3 (C) 12 (D) 1
- Q12: Suppose a channel was operating 1Mhz using FDM. If we switch over into CDMA technology using chip sequence size is 8 bits. Then what additional band width will be required to implement CDMA?  
(A) 8Mhz (B) 4Mbps (C) 2Mbps (D) 10 KHZ
- Q13. Which protocol is used to retrieve mails from mailbox  
(A) POP3 (B) E-mail (C) SNMP (D) ICMP

## DATA STRUCTURE

- Q1. What is the relation between front and rear parameters of a circular queue of maximum size 'n' to conclude that the queue is full?  
(A)  $(rear+1)\%n=front$  (B)  $rear=front$  (C)  $rear-1=front$  (D)  $front=front* rear$
- Q2. What is value of the following prefix expression?  
 $+, -, *, 2, 3, 5, /, \uparrow, 2, 3, 4$   
(A) 7 (B) 3 (C) 56 (D) 2

- Q3. Which data structure is used to calculate factorial of a number using recursion?  
 (A) stack (B) tree (C) queue (D) Hashing
- Q4. How many disk movements are required to solve the Tower of Hanoi puzzle with 7 disks?  
 (A) 64 (B) 7 (C) 128 (D) 14
- Q5. If a connected graph has all edges have equal weight. Then which of the following algorithm can efficiently solve the single source shortest path problem  
 (A) BFS (B) Dijkstra (C) DFS (D) Krushkal
- Q6. How many binary search trees can be constructed using exactly 4 keys?  
 (A) 24 (B) 20 (C) 13 (D) 11
- Q7. If  $u$  and  $v$  are non-adjacent vertices of a connected graph with  $n$ -nodes, then the sufficient condition for the graph to be Hamiltonian is  
 (A)  $d(v) + d(u) < n$  (B)  $d(v) + d(u) \geq n$  (C)  $d(v) = d(u)$  (D)  $2d(v)$
- Q8. What is the worst number of comparisons required to insert a key to a 2-3-4 tree having  $n$ -keys:  
 (A)  $3 \log n$  (B)  $n$  (C)  $\log n$  (D)  $7n$
- Q9. How many rotations are required to balance a tree if it was constructed with keys in the order 9, 15, 13, 14?  
 (A) 4 (B) 7 (C) 5 (D) 3
- Q10. If a hash table size is 5, and keys are 0, 1, 2, 4, 3, 13, 50, 24. Then how many collisions will occur in division remainder hashing?  
 (A) 3 (B) 5 (C) 13 (D) 50

### DMS

- Q1. What is the minimal expression of the following Boolean expressions “ $xy' + x'y + x'y'$ ”?
- Q2. Find the solution of the recurrence relation  $(a_n)^2 - (a_{n-1})^2 = 1, n \geq 1, a_0 = 1$ .  
 (A)  $a_n = \sqrt{n+1}$  (B)  $n * n$  (C)  $a_n = 2^n$  (D)  $a_n = 2^n + n$
- Q3. How many committees of five people can be chosen from 20 men and 12 women if at least three women must be in each committee?
- Q4. How many elements you will have in a symmetric group  $S_4$ ?
- Q5. Find the least upper bound and greatest lower bound of the set  $\{3, 9, 12\}$  if exist, in the poset  $(\mathbb{Z}^+, |)$ . Where  $|$  is a divide relation.  
 (A) 3, 36 (B) 3, 12 (C) 3, 9 (D) 12, 3
- Q6. Give an example of non-abelian group having an abelian subgroup.
- Q7. Draw the hasse diagram and find the maximal and minimal elements of the poset  $(\{2, 4, 5, 10, 12, 20, 25\}, |)$ . Where  $|$  denotes the divide relation.
- Q8. Find the minimum number of students in a class to be sure that three of them are born in the same month.
- Q9. Let  $A = \{1, 2, 3, 4\}$  and  $R = \{(1, 2), (2, 3), (3, 4), (2, 1)\}$ , then find the transitive closure of  $R$
- Q10 How many positive integers not exceeding 1000 are divisible by 7 or 11.

# SYLLABUS FOR SSB Computer Science

## UNIT 1. DISCRETE STRUCTURES AND DIGITAL LOGIC

Propositional Logic, Predicate calculus, Sets, Relations, Functions, Inclusion-Exclusion Principle, Equivalence and Partial Orderings, Elementary Counting Techniques.

Computability: Models of computation-Finite Automata, Pushdown Automata, Non-determinism and NFA, DPDA and PDAs and Languages accepted by these structures, Grammars, Languages, Non-computability and Examples of non-computable problems.

Graph: Definition, walks, paths, trails, connected graphs, regular and bipartite graphs, cycles and circuits. Tree and rooted tree, Spanning trees, Eccentricity of a vertex radius and diameter of a graph, central Graphs, Centers of a tree, Hamiltonian and Eulerian graphs, Planar graphs, Graph Coloring.

Groups: Finite fields and Error correcting/ detecting codes.

Logic Families: TTL, ECL, and C-MOS gates, Boolean algebra and Minimization of Boolean functions, Flip-flops-types, race condition and comparison, Design of combinational and sequential circuits.

Representation of Integers: Octal, Hexadecimal, Decimal, and Binary, 2's complement and 1's complement arithmetic, Floating point representation.

Arithmetic : Addition and subtraction of signed Numbers, Design of Fast Adders, Multiplication of positive Numbers, Signed-operand multiplication , Fast multiplication, Integer Division, Floating-point Numbers, (IEEE754 s...) and operations.

## UNIT 2. PROGRAMMING IN C AND C++

Programming in C: Elements of C-Tokens, identifiers, data types in C, Control structures in C, Sequence, selection and iterations, Structured data types in C-arrays, structure, union, string and pointers.

Object Oriented Programming Concepts: Class, object, instantiation, Inheritance. Polymorphism and Overloading.

C++ Programming: Elements of C++ -Tokens, identifiers, Variables and constants, Data types, Operators, Control statements, Functions parameter passing, Class and objects, Constructors and destructors, Overloading, Inheritance, Template, Exception handling.

## UNIT 3. DATA STRUCTURES AND ALGORITHMS

Data, Information, Definition of data structure, Arrays, stacks, queues, linked lists, trees, graphs, priority queues and heaps.

File Structures: Fields, records and files, Sequential, direct, index-sequential and relative files, Hashing, inverted lists and multi-lists, B trees and B+ trees.

## UNIT 4. ARCHITECTURE AND OPERATING SYSTEMS

Main functions of operating systems, Multiprogramming, Multiprocessing, and Multitasking.

Memory Management: Virtual Memory, Paging, Fragmentation.

Concurrent Processing: Mutual exclusion, Critical regions, lock and unlock.

Scheduling: CPU scheduling, I/O scheduling, Resource scheduling, Deadlock and scheduling algorithms, Banker's algorithm for deadlock handling.

## UNIX

The Unix System: File system, process management, bourne shell, shell variables, command line programming.

Filters and Commands: Pr, head, tail, cut, paste, sort, uniq, tr, join, etc., grep, egrep, fgrep, etc., sed, awk, etc.

System Calls (like): Create, open, close, read, write, isseek, link, unlink, stat, fstat, unmask, chmod, exec, fork, wait, system.

## UNIT 5. COMPUTER NETWORKS AND DATABASES

Network fundamentals: Local Area Networks (LAN), Metropolitan Area Networks (MAN), Wide Area Networks(WAN), Wireless Networks.Reference Models: The OSI model, TCP/IP model.

Data link control: Channel capacity, Transmission media -twisted pair, coaxial cables, fiber-optic cables, wireless

transmission –radio, microwave, infrared and millimeter waves, Light wave transmission, Telephones –local loop, trunks, multiplexing, switching, narrowband ISDN, broadband ISDN, ATM, High speed LANS, Cellular Radio, Communication satellites -geosynchronous and low-orbit, Switch/Hub, Bridge,Error detection and correction,Flow control.

Internetworking: Router, Gateways, Concatenated virtual circuits, Tunneling, Fragmentation, Firewalls.Routing: Virtual circuits and datagrams, Routing algorithms, Congestion controland avoidance, TCPCongestionmanagement policy.

Cryptographyand Protocols of network applications: Public key, secret key, Domain Name System (DNS) - Electronic Mail and World Wide Web (WWW), The DNS, Resource Records, Name servers, E-mail-architecture and Servers, Web server, HTTP.

ER diagrams and their transformation to relational design, normalization –1NF, 2NF, 3NF, BCNF, 4NF. Limitations of 4NF and BCNF.

SQL: Data Definition Language (DDL), Data Manipulation Language (DML), Data Control Language (DCL) commands, Database objects like –Views, indexes, sequences, synonyms, data dictionary.

## **7. SYSTEM SOFTWARE AND COMPILERS**

Assembly language fundamentals (8085 based assembly language programming).Assemblers –2-pass and single-pass, Macros and macro processors.

Loading, linking, relocation, program relocatability, Linkage editing.

Text editors, Programming Environments, Debuggers and program generators.

Compilation and Interpretation, Bootstrap compilers, Phases of compilation process, Lexical analysis, Lex package on UNIX SYSTEM.

Context free grammars, Parsing and parse trees, Presentation of parse (derivation) trees as rightmost and leftmost derivation, Bottom up parsers –shift-reduce, operator precedence, and LR, YACC package on UNIX system.

Top down parsers –left recursion and its removal, Recursive descent parser, Predictive parser, Intermediate codes – Quadruples, Triples, Intermediate code generation, Code generation, Code optimization.