

PGIS-N 1042 B-14
M.Sc. Ist Semester (CBCS) Degree Examination
Computer Science
(Mathematical Foundation of Computer Science)
Paper -HCT:1.2
(new syllabus under CBCS w.e.f 2011-12)

Time : 3 Hours

Maximum Marks : 80

Instructions to candidates:

- i) Question No.1 in section A is compulsory
- ii) Answer any 5 questions from section-B
- iii) Answer all questions carry equal marks

Section-A

1. a) Suppose that the sets A and B have m and n elements respectively. How many are in $A \times B$? How many different relations are there from A To B? (10x2=20)
- b) Does $(p \rightarrow q) \Rightarrow (\neg q \rightarrow \neg p)$ true?
- c) Represent the following argument in symbolic form. Lions are dangerous animals. there are lions. Therefore there are dangerous animals
- d) Find r, if $5^{\log p} = 6^{\log p - 1}$
- e) Define partition of a set. Give an example
- f) Find the complement for the boolean expression: $x(y'z' + yz)$
- g) Define the degree of a vertex in a graph
- h) Draw a graph which is both Hamiltonian and eulerian
- i) define abelian group? Give an example of a group which is not abelian
- j) Define a context free grammar with an example

Section-B

2. a) Prove the following equivalence : $p \rightarrow (q \cup r) = (p \rightarrow q) \cup (p \rightarrow r)$ (6)
- b) Using mathematical induction, show that (n^3+2n) is divisible by 3, for all $n \geq 1$

3. a) Let R denote a relation on the set Z of all integers defined by $R = \{(x, y) : x, y \in Z, x - y \text{ is multiple of } 3\}$ show that R is an equivalence relation
- b) Let $f(x) = x + 2, g(x) = x - 2, h(x) = 3x, \forall x \in R$ find $g \circ f, f \circ g, f \circ f, g \circ g, h \circ g$ and $h \circ f$
4. a) State and prove De-Morgan's theorem in Boolean Algebra
- b) Solve the recurrence relation: $ar + 5a_{r-1} + 6a_{r-2} = 3r^2$
5. a) Show that the sum of the degrees of the vertices of a graph is equal to twice the number of edges
- b) Show that a given connected graph G is an Euler graph if and only if all vertices of G are of even degree
6. a) State and prove the pigeonhole principle.
- b) If G is a group, then prove the following:
- The identity element of G is unique
 - Every $a \in G$ has a unique inverse in G
7. a) Obtain the grammar that generates the language: $L = \{a^n b a^n : n \geq 1\}$ is not a finite state language
- b) Show that the language $L = \{a^k ; k = i^2, i \geq 1\}$ is not a finite state language
8. a) Find the distance between X and Y in each of the following cases:
- $x = 110110 \quad y = 000101$
 - $x = 001100 \quad y = 010110$
 - $x = 11100011 \quad y = 01101100$
- b) Write a short note on any two of the following:
- first order logic
 - unification and SLD-resolution
 - Error detection

PGIS-N 1044 B-14
M.Sc. Ist Semester Degree Examination
Computer Science
(Data structures Using C++)
Paper : HCT - 1.3
(new syllabus under CBCS w.e.f 2011-12)

Time : 3 Hours

Maximum Marks : 80

Instructions to candidates:

1. *Question No.1 in section A is compulsory*
2. *Answer any 5 questions from section-B*

Section-A

1. Answer the following (10x2=20)
- a) Explain the features of keyword “new” and “delete”
 - b) Compare “Struct” and “Class” keywords of C++
 - c) What is the need of friend function in C++?
 - d) State the important applications of linked list
 - e) Explain the node structure of doubly linked list
 - f) Convert the infix expression $E:(A+B) \wedge C - (D/C) * E$ into a post fix expression
 - g) Explain m-way search tree
 - h) Define Huffman code
 - i) State the types of graph storage structures
 - j) What is an external sorts

Section-B

2. Why should default values be given to function arguments in function prototype and not in function definition? Write a program to add three numbers using function which has one or more default values
3.
 - a) What are virtual functions? What is their use? Give an example. How compilers resolve a call a virtual function
 - b) What is operator overloading? Write a C++ program to compare two values representing distances in feet and inches, using overloading the operator > (6+6)
4.
 - a) Explain the linked list implementation of stack data structures. Design an algorithm to deliver the goods and receiving of goods in an inventory system
 - b) Develop an algorithm to transverse the linked list explain how do you use this algorithm by making appropriate changes to search an element in the linked list
(6+6)
5.
 - a) What is recursion? explain the steps to design a recursive algorithm
 - b) Define tree, expression tree and binary search tree. Design an algorithm to tranverse the binary tree.
(6+6)
6.
 - a) Define heap tree. Design an algorithm to insert the data "ITEM" into the heap tree.
 - b) Explain the steps that are to be adopted to balance an unbalance tree due to insertion of a node.
(6+6)
7.
 - a) Define the term sorting and explain how do you sort the given list with selection sort technique
 - b) What are the graph storage structures? Design an algorithm to insert a vertex into a undirected graph
(6+6)

8. Write short note on any **two** of the following

a) Binary search tree

b) queue applications

c) ADT-linked list

(6 each)
