

Roll No. _____

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 $5pr = 6pr - 1$
- 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 gof, fog, fof, gog, hog and $hogof$
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:
i) The identity element of G is unique
ii) 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:
i) $x = 110110, y = 000101$
ii) $x = 001100, y = 010110$
iii) $x = 11100011, y = 01101100$
b) Write a short note on any two of the following:
i) first order logic
ii) unification and SLD-resolution
iii) Error detection