Session

2013 - 14

BANGABASI COLLEGE
TEST EXAMINATIONS, 2014
PART- II (1 + 1 + 1 SYSTEM)
COMPUTER SCIENCE (HONOURS)
THIRD PAPER

Full Marks – 100 **Total Time – 4 Hrs**

Answer Question No. – 1 and any FIVE questions from the rest taking at least TWO questions from Group A and ONE question each from Group B and Group C.

Question No. – 1 : Answer any *TEN* of the following : $10 \times 2 = 20$

a) Differentiate between 'isolated vertex' and 'pendant vertex' of a graph.
b) What is Euler graph?
c) State the Konisberg bridge problem in Graph Theory.
d) Define simple connected graph.
e) Distinguish between walk and a path in a graph.
f) Define cut-set of a graph.
g) What is existential quantifier of a predicate?
h) Define tautology.
i) Define an equivalence relation.
j) Consider two functions f(x) and g(x). Define $f(x) = \Omega(g(x))$.
k) Give the condition for convergence of Gauss-Seidl iteration method.
l) In a linear programming problem, what is meant by basic feasible solution?
m) What is an unbounded solution in L.P.P. ?
n) What is a Finite State Machine?
o) Define Mealy Machine.
p) What is a phrase structure grammar?

Group – A (Discrete Mathematical Structures)

Question No. – 2 : $8 + (2+2+2+2) = 16$

a) Describe Prim's Algorithm with suitable example.
b) What is a digraph? Define in-degree and out-degree of a vertex in a digraph. What can you say about the sum of in-degrees and the sum of out-degrees? Illustrate.

Question No. – 3 : $4 + 7 + 5 = 16$

a) Define the terms Hamiltonian path and Hamiltonian circuit with examples.
b) Describe Kruskal's algorithm to compute minimal spanning tree with example.
c) Prove that a simple graph with n vertices and k components can have at most (n-k)(n-k+1)/2 edges.

Question No. – 4 : $(3 \times 4) + 4 = 16$

a) Define the following relations and give one example of each:
   i. Reflexive Relation
   ii. Symmetric Relation.
   iii. Anti-symmetric Relation.
   iv. Equivalence Relation.

b) Show that $(p \vee q) \rightarrow r$ and $(p \rightarrow q) \vee (q \rightarrow r)$ are logically equivalent.

Question No. – 5 : $5 + 5 + 6 = 16$

a) State and prove generalized Pigeon Hole principle.

b) Find the count of all 3 – digit numbers less than 500 that are either divisible by 4 or divisible by 6 but not by both.

c) How can you relate big-Oh, big-Omega and big-Theta notations? Justify your answer.

Group – B (Numerical and Optimization Techniques)

Question No. – 6: $8 + 8 = 16$

a) Use Gauss-Jordan method to solve the following system of equations:
$4x + y + 2z = 16,\ x + 3y + z = 10,\ x + 2y + 5z = 12$

b) Discuss Gauss-Elimination method using examples.

Question No. – 7 : $8 + 8 = 16$

a) Discuss Gauss-Seidel iterative method for solving system of linear equations. Give an estimate for convergence.

b) Solve the following by Gauss Elimination method :
$2x + 2y + 4z = 18$
$x + 3y + 2z = 13$
$3x + y + 3z = 14$

Group – C (Automata Theory)

Question No. – 8 $4 + (3 + 3 + 6) = 16$

a) Differentiate between DFA and NDFA with examples.

b) Given the following NDFA :

State	Next State		
	Input = a	Input = b	Input = c
→ q0	q1, q2	q2, q3	q1, q3
q1	q0, q3	q1, q2	q0
q2	q1, q3	q0	q1, q3

q3	q1	q2	q3

i. Construct transition diagram for the NDFA.
ii. Test whether the string *abcabcabc* are accepted by the transition system.
iii. Construct a DFA equivalent to the NDFA.

Question No. – 9: $4 + 4 + (2 + 2 + 2) + 2 = 16$

a) Find the language equivalent to the grammar G = ({S, A}, { 0, 1}, { S → 0S0|1A2, A→1A2|12}, S).
b) Construct a grammar generating { $x^n y^m x^n$ | n ≥0, m≥1 }
c) What is a context-free grammar? What is its difference with a context-sensitive grammar? Give examples of each.
d) Define Turing Machine.