B.Tech. Degree III Semester Examination November 2013

CS/IT 1303 DISCRETE COMPUTATIONAL STRUCTURES

(2012 Scheme)

Time : 3 Hours | Maximum Marks : 100

PART A

(Answer *ALL* questions)

(8 x 5 = 40)

I. (a) Define tautology and contradiction with an example.

(b) State De-Morgan's Law for logic.

(c) Write an algorithm to find the maximum of a finite sequence of numbers.

(d) State Pigeohole principle with an example.

(e) Write a note on travelling salesman problem in graph theory.

(f) Define minimal spanning tree.

(g) Consider an algebraic system $(G,*)$ where G is the set of all non-zero real numbers and $*$ is a binary operation defined by $a*b=\frac{ab}{2}$. Show that $(G,*)$ is an abelian group.

(h) Define semigroup and lattice.

PART B

(4 x 15 = 60)

II. (a) Prove that $(p \to q) \leftrightarrow (\upsilon p) \vee q$ is a tautology. (7)

(b) By mathematical induction, prove that (8)

$$1^3+2^3+....+n^3=\left[\frac{n(n+1)}{2}\right]^2$$

OR

III. (a) Determine whether the given arguments are valid or not. (7)

(i) $p \to q$, p, $\therefore q$ (ii) $p \to q$, q, $\therefore p$

(b) Consider f, g and h, all functions on the integers by (8)
$f(n)=n^2$, $g(n)=n+1$ and $h(n)=n-1$. Determine: (i) hofog (ii) gofoh (iii) fogoh

IV. (a) Solve the recurrence relation $2a_r-5a_{r-1}+2a_{r-2}=0$ with initial condition $a_0=0$ and $a_1=1$ (10)

(b) From a club consisting of 4 men and 6 women, in how many ways we can select a committee of 3 men and 4 women. (5)

OR

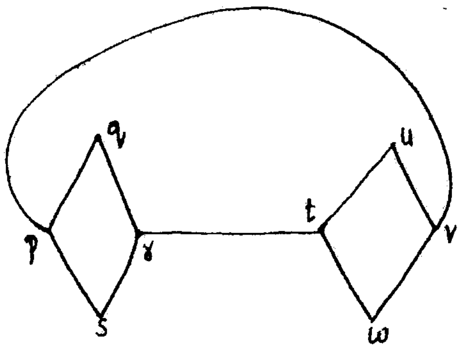
V. (a) Define recursive algorithm and explain the recursive algorithm for finding the factorial of n. (7)

(b) Solve recurrence relation $a_r-4a_{r-1}+4a_{r-2}=0$ with initial condition $a_0=1$ and $a_1=6$ (8)

(P.T.O.)

VI. (a) Prove that the sum of degree of all the vertices in a graph G, is even. (5)

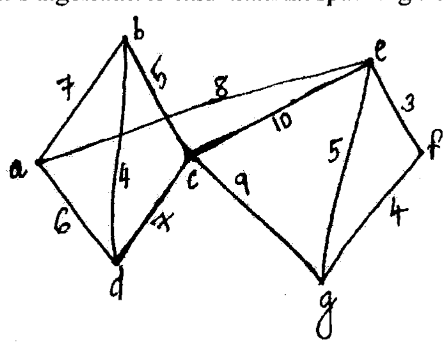
(b) Use Fleury's algorithm to find an Euler cycle in the following graph. (10)



OR

VII. (a) Prove that in any graph, there are an even number of vertices of odd degree. (5)

(b) Apply Kruskal's algorithm to find minimal spanning tree of the following graph (10)



VIII. (a) Let $A\{a,b\}$, which of the following tables defines a semigroup on A? Which define monoid on A? (10)

(i)

*	a	b
a	a	b
b	a	a

(ii)

*	a	b
a	a	b
b	b	a

(b) Let $(A,*)$ be a semigroup. For every a, b in A, (5)
if $a \neq b$ then $a*b \neq b*a$ and $a*a=a$

(i) show that for every a,b in A, $a*b*a=a$

(ii) show that for every a,b,c in A, $a*b*c=a*c$

OR

IX. Let $D_{100}=\{1, 2, 4, 5, 10, 20, 25, 50, 100\}$ and let the relation be 'the divides', be a partial ordering on D_{100}. Draw the Hasse Diagram. (15)

(i) Determine the GLB and LUB of B, where $B=\{5, 10, 20, 25\}$

(ii) Determine the GLB and LUB of B, where $B=\{10, 20\}$

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