BTS-III (15) -11.16.1517 Reg. No. [| | | | | | | |]

B

B.Tech. Degree III Semester Examination November 2016

CS/IT 15 – 1303 DISCRETE COMPUTATIONAL STRUCTURES

(2015 Scheme)

Time : 3 Hours Maximum Marks : 60

PART A

(Answer *ALL* questions)

(10× 2 = 20)

I. (a) Verify that given compound proposition is tautology or not

$(p \to q) \leftrightarrow (\sim q \to \sim p)$

(b) Which of the following is not a partition of the set S = {1,2,3,……,8,9}?. Write the reason for it.

(i) $P_1 = [\{1\}, \{2,3,4\}, \{5,6\}, \{7\}, \{8,9\}]$

(ii) $P_2 = [\{1,3,5\}, \{2,7\}, \{4,6,8,9\}]$

(iii) $P_3 = [\{1,3,4\}, \{2,6,7,8,9\}]$

(iv) $P_4 = [\{1,3,5\}, \{2,4,6\}, \{7,8,9\}]$

(c) State and explain time complexity of an algorithm.

(d) Write an algorithm to find the n^{th} Fibonacci number in a series.

(e) Define bipartite graph and draw a complete bipartite graph $K_{3,4}$.

(f) Explain how a graph can be represented using incidence matrix.

(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 = ab/4. Show that (G,*) is an abelian group.

(h) What are partially ordered sets and lattice?

(i) Define complete graph and regular graph with an example.

(j) Using Pigeon hole principle, show that if 9 colours are used to paint 100 houses, at least 12 houses will be of same colour.

PART B

(4 × 10 = 40)

II. Using the principle of mathematical induction, show that: (10)

$$1^3 + 2^3 + 3^3 + \ldots\ldots + n^3 = \frac{[n(n+1)]^2}{4}$$

OR

III. (a) Let f, g and h be the functions defined on a set of positive integers defined by the equations $f(x) = n^2, g(x) = n+1$ and $h(n) = n-1$. Find hofog, gofoh and fogoh. (6)

(b) Show that $(p \to q)$ is logically equivalent to $(\sim p V q)$ using truth table. (4)

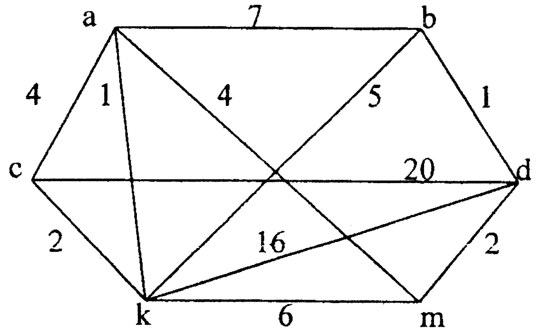
IV. Solve recurrence relation $a_n - 7a_{n-1} + 10a_{n-2} = 0$ with $a_0 = 3, a_1 = 3$ by method of generation function. (10)

OR

(P.T.O)

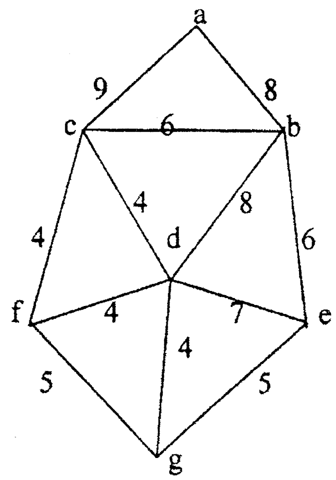
V. Solve recurrence relation $a_{n+2} - 3a_{n+1} + 2a_n = 0$ with initial condition $a_0 = 2$ and $a_1 = 3$. (10)

VI. Use Dijkstra's algorithm to find the shortest path between 'c' and 'd' in the graph shown in figure. (10)



OR

VII. Apply Kruskal's algorithm to find minimum spanning tree of the following graph. (10)



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

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

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

OR

IX. Let a = {a,b}, which of the following tables defines a semigroup on A? Which defines a monoid on A? (10)

(i)

*	a	b
a	a	b
b	a	a

(ii)

*	a	b
a	a	b
b	b	a

(iii)

*	a	b
a	b	b
b	a	a

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