

RAMAKRISHNA MISSION VIDYAMANDIRA

(A Residential Autonomous College)

Belur Math, Howrah

B.A./B.Sc. 1st Semester (July – December 2010)

Mid-Semester Examination, September 2010

Date: 06.09.2010

Computer Science (Honours)

Full Marks 50

Time: 11 am – 1 pm

Answer any 5 questions

1. (a) Explain the concept of Graph with proper examples. 2
(b) What do you mean by an algorithm? Explain its characteristics. 2+2
(c) State De Morgan's laws. 2
(d) What is dual of a Boolean function? 2
2. (a) Prove that for a graph with n vertices and k components maximum number of edges can be $\frac{1}{2}(n-k)(n-k+1)$. 4
(b) What do you mean by Universal gate? Give examples. 3
(c) What is flowchart? Give examples. 3
3. (a) Prove that $2^n = O(n!)$, where O denotes big Oh notation. 3
(b) Write an algorithm to find 2nd largest number from a set of n given numbers. 4
(c) What do you mean by SOP and POS? Give examples. 3
4. (a) What do you mean by Minimal spanning tree of a connected weighted graph? Is it unique? Justify your answer. 2+2
(b) Write an algorithm to find Maximal spanning tree of a graph. Illustrate your algorithm with a non-trivial examples. (Clearly write all of your assumptions regarding the algorithm) 3+3
5. (a) Write a recursive algorithm to find the sum of n given elements stored in an array. Analyse the best case, average case and worst case of your algorithm. 3+3
(b) "Gray Code is used in K-map technique" – Justify. 2
(c) A connected graph with n vertices is complete such that weight of the edge (v_i, v_j) is $2|i-j|$. Find sum of weights in Minimal spanning tree. 2
6. (a) Design a digital circuit which accept a 3 bit number and produces square of this given number. 7
(b) Draw a flow chart to compute factorial of a given number. (Check for input validity also). 3
7. (a) Design a quadruple 2-to-1 multiplexer with enable line. 5
(b) Write geometrical significance of Big Theta notation. 3
(c) Compute $(123)_{10} - (57)_{10}$ using 10's complement method for subtraction. 2