

THAPAR INSTITUTE OF ENGINEERING & TECHNOLOGY
COMPUTER SCIENCE & ENGINEERING DEPARTMENT
 Semester : July-Dec 2006

Course Code : CS-024
 Course : CAD for VLSI

Max. Marks : 72
 Time : 3 Hours

Note : 1) All questions are compulsory.
 2) Attempt all parts of a question sequentially at one place.

1. For the rectangular floorplan shown in Fig. 1 and corresponding cell's sizes as given in Table 1, attempt the followings –

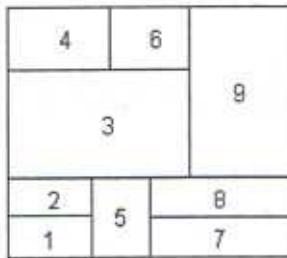


Fig. 1 Floorplan

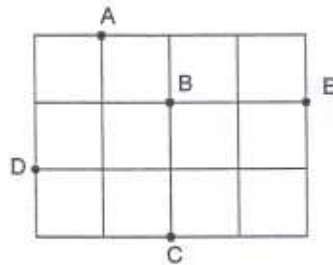
Module No.	Width	Height
1	2	1
2	2	2
3	4	3
4	3	1
5	1	3
6	1	1
7	3	2
8	3	1
9	2	4

Table 1 Cell sizes

- a) Draw the vertical and horizontal adjacency graphs corresponding to the above floorplan.
 - b) Use the adjacency graphs to determine the minimum required width and height of the floorplan
 - c) Draw the skewed slicing tree corresponding to the above slicing floorplan.
 - d) Determine the normalized polish expression corresponding to the skewed slicing tree. (4x4)
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2. a) What are the general uses of global routing? Explain. 4
 - b) Discuss the global routing problem and objectives for various layout styles, namely, gate-array, standard-cell and building block design style. 6
 - c) Suggest at least two techniques for removing cycles from the ordered constraint graph. 4
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3. a) S and T are two points on a routing grid. The horizontal separation between S and T is m units, and the vertical separation is n units. Show that there are $R(m, n) = \binom{m+n}{m}$ ways of routing a two-pin net from S to T. Assume that only vertical and horizontal routing are permitted, and assume that there is a single routing layer. What happens to $R(m, n)$ when $m = n$? 8
 - b) In the above problem, if we permit 45° and 135° routing also, how many ways are there to route a net from S and T? 4

c) The label clearing phase of Lee algorithm is as complex as the filling phase. Suggest a technique to speed up this process. 2

4 For the 5-point net shown below, attempt the followings -



- a) The cost of connecting one point to another is measured by the Manhattan distance between two points. Construct a minimum spanning tree to join all the five points of the net. What is the cost of minimum spanning tree? 3
- b) Calculate the cost using minimum chain method. Compare the resulting cost with that of minimum spanning tree method. 3
- c) Discuss the placement problem cost functions and constraints parameters. 8

- 5
- a) Draw the 3-input CMOS NAND gate. 3
 - b) Write difference between Artificial neural network computing and conventional computing. 4
 - c) Explain hardware software co-design. 4
 - d) Explain supervised and unsupervised learning methods of neural network. 3