

BACHELOR OF COMPUTER SC. ENGG. EXAMINATION, 2015

(3rd Year, 1st Semester)

VLSI DESIGN

Time : Three hours

Full Marks : 100

Answer any **five** questions with at least **one** question from **Group-A**.

GROUP-A

1. a) What is semiconductor?
b) Explain VLSI design Cycle?
c) What is photoresist? Explain its uses in fabrication process.
d) Deduce the pull-up to pull-down impedance ratio of an ideal CMOS inverter..

2+5+4+9

2. a) Implement the following Boolean function with the help of (i) nMOS (ii) pMOS (iii) CMOS NAND gates (iv) CMOS single complex cell design.

$$f = A \bar{B} + \bar{A}C + \bar{C}D$$

- b) Draw the coloured stick diagram for implementing the Boolean function mentioned in question 3 (a) using (i) NMOS (ii) CMOS.
- c) What do you mean by λ -based IC design rules? Explain nMOS design rules.

10+5+5

GROUP-B

3. a) What are the different levels of partitioning?
b) Consider a complete binary tree with n nodes. Apply Kernighan-Lin (K-L) algorithm to this graph. As the initial partition, let v_a , for all internal vertices, be in one set and v_b , for all leaves, be in the other set.
c) What are the drawbacks of Kernighan-Lin algorithm?
d) State the similarities between Fiduccia-Mattheyses algorithm and K-L algorithm.

4+10+3+3

4. a) State with an example how a sliceable floorplan can be represented by a binary tree.
b) Obtain a rectangular dual of the following adjacency graph (Fig.1).

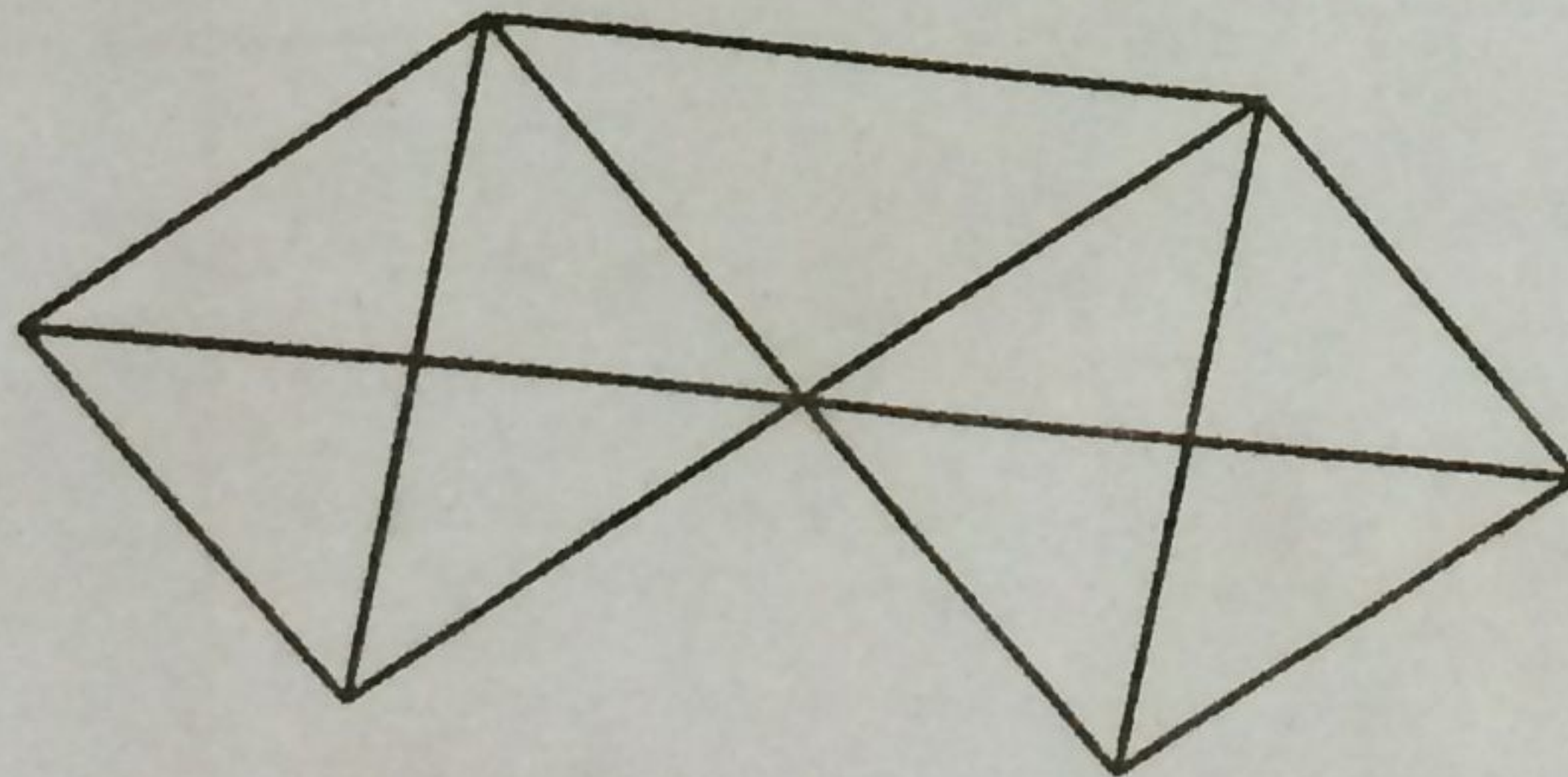


Fig.1

- d) How do you estimate the cost of floorplan. Consider the adjacency graph of Fig.2 where the edge weights are providing the distance between two vertices. Estimate the routing cost in different sliceable floorplans for it.

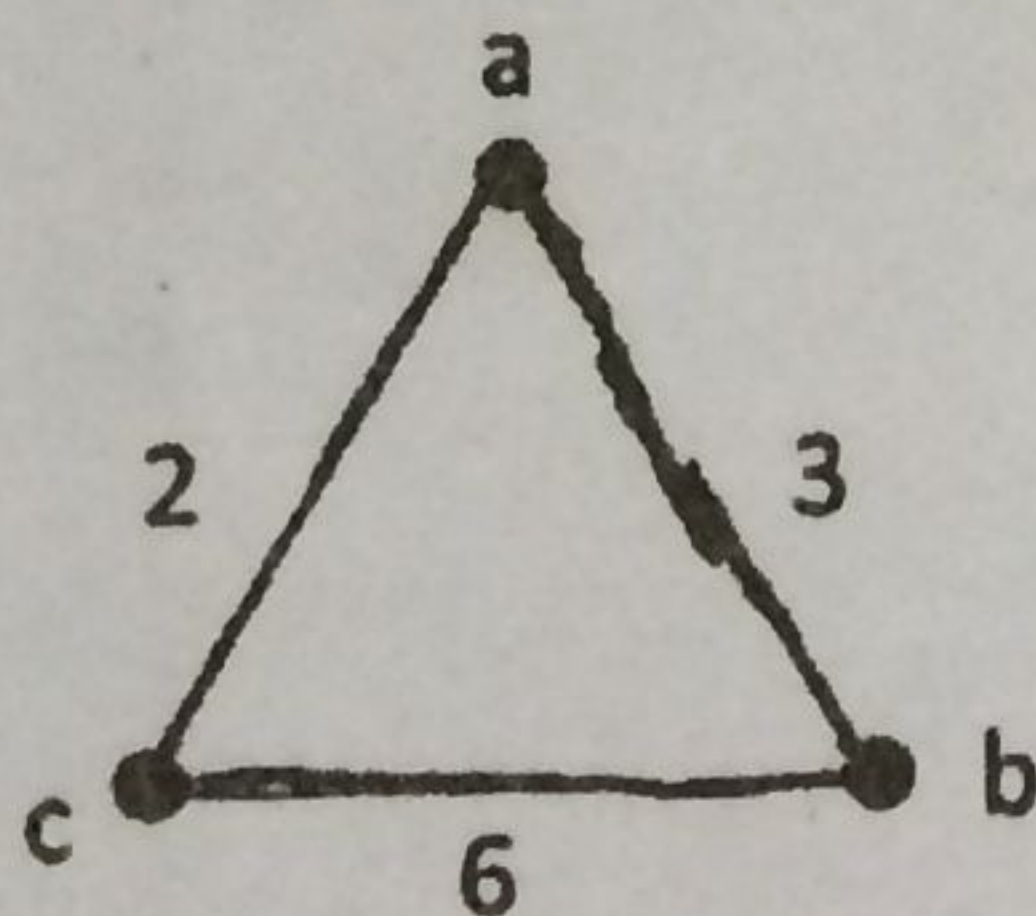


Fig. 2

- d) State the advantages of integer linear programming technique in case in floorplanning.

3+7+7+3

5. a) Formulate the placement problem.
 b) State two different approaches in Force directed algorithm. What are pros and cons of Force directed algorithm?
 c) Explain the different procedures for Breuer's Algorithm. What are pros and cons of Breuer's algorithm?

3+7+10

6. a) Explain Global Routing and Detailed Routing.
 b) Explain the different graph models used in Global Routing.
 c) Give an example or counter example as the case may be for the following statement: Soukup's maze router always produces the shortest path.
 d) Explain grid-based and gridless model in case of detailed routing.
 e) Draw the constraint graphs and compute the lower bound on number of tracks for the following channel

TOP = {7 2 7 0 0 1 4 6 0 7 4 0}

BOT = {2 5 6 5 6 2 1 0 3 0 3 4}

4+4+4+3+5

7. a) Route the following channel using Y-K algorithm or Greedy Channel Router and compare their results..

TOP = 1 0 2 0 0 1 3 0 2 4 3 1 0 5 2 0 5 5 0 6 4 0

BOT = 2 0 3 6 4 2 0 1 0 0 4 6 4 0 3 5 0 6 0 2 0 5

- b) How cluster graph model is used in constrained via minimization? State with an example.
 c) Get the solution for unconstrained via minimization for the graph of Fig.3 .

8+6+6

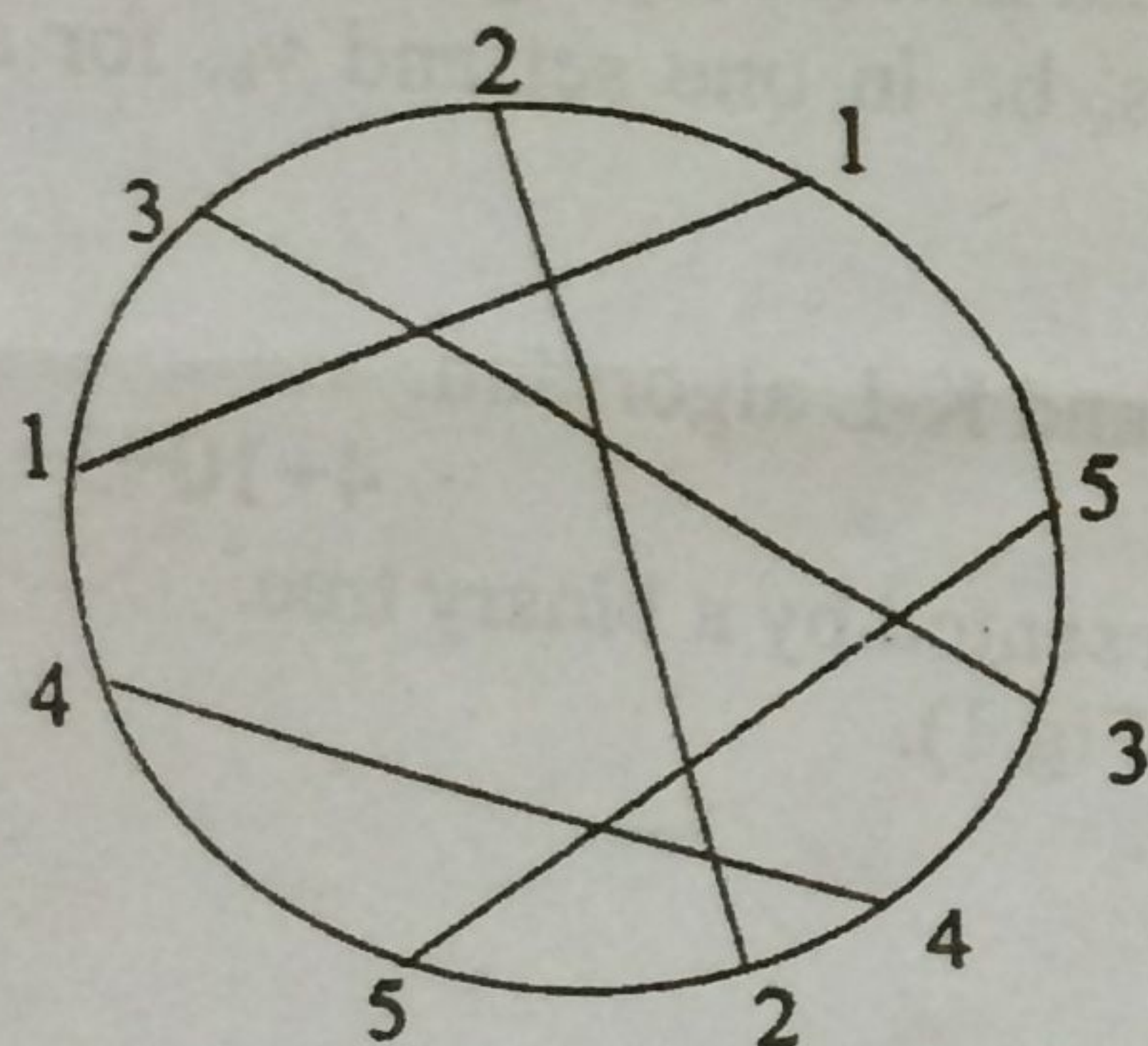


Fig. 3