國 立 臺 北 科 技 大 學

一百零五學年第一學期電機系博士班資格考試

積體電路實體設計演算法　試題

<table>
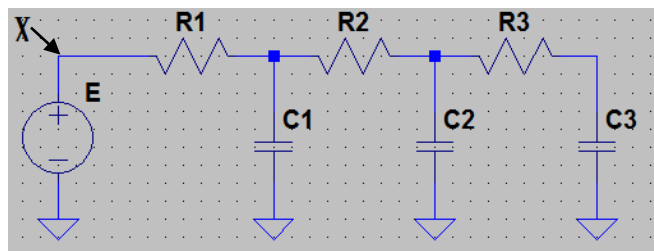<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
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注意事項：

1. 本試題共【8】題，配分共 100 分。
2. 請按順序標明題號作答，不必抄題。
3. 全部答案均須答在試卷答案欄內，否則不予計分。
4. 考試時間：二小時。

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1. Design a CMOS circuit of function $F = \overline{AB+CD}$. (10%)

2. Elmore model is widely used in the field of physical design.
   (a) Briefly describe the principle of Elmore model. (5%)
   (b) For the graph shown below, find the Elmore delay in point X. (5%)

3. (a) What is the difference between a spanning tree and a Steiner tree? (10%)
   (b) What is the Manhattan distance between (3, 3) and (8, 7)? (5%)
   (c) For the graph shown below, what is the result of relaxation if we want to find the shortest path? (5%)
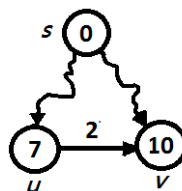
4. (a) Explain how does Lee's (or maze routing) algorithm perform "WAVE PROPAGATION". (10%)

    (b) Label the grids after performing Lee's algorithm on a 5×5 grids with an obstacle (colored black), where the start grid (S) and target grid (T) are respectively located at (1, 1) and (3, 4). (5%)
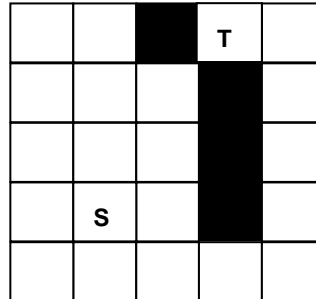
5. Express the following floorplan in slicing tree and Polish expression respectively. (10%)
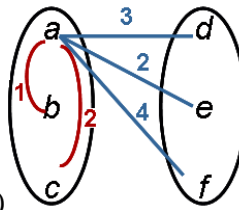

6. Given the following Polish expression $E = 12H67V45V3HHV$,

    (a) Does the above expression satisfy the balloting property? Justify your answer. (5%)

    (b) Is E a normalized Polish expression? If not, change an operator and its adjacent operand to transform E into a normalized Polish expression E'. (5%)

7. (a) A typical formula for calculating cost function of a floorplan is shown below, what does A, λ, and W respectively mean? (5%)

    $Cost = A + \lambda \times W$

    (b) Sometimes we use the formula as shown below to calculate the cost function of a floorplan, explain what does A, W, α, A_{norm}, and W_{norm} mean, respectively. (5%)

    $Cost = \alpha \times A/A_{norm} + (1-\alpha) \times W/W_{norm}$

    (c) Explain why the formula in (b) is better than that in (a). (5%)

8. Based on KL partitioning algorithm,

    (a) For the connection shown below, what is the External cost and Internal cost of vertex

a, respectively? (5%)

(b) What is the D-value of vertex *a*? (5%)