中山大学软件学院 **2010** 级软件工程专业(2010学年春季学期)

《SE-106 离散数学》期末考试试卷(A)

(考试形式： 闭卷 考试时间：2 小时)

警示

《中山大学授予学士学位工作细则》第六条

考试作弊不授予学士学位

方向：_____ 姓名：_____ 学号：_____

注意：答案一定要写在答卷中，写在本试题卷中不给分。本试卷要和答卷一起交回。

1. **(10 points)** Let A and B be sets, Prove or disprove the following statements
   (a) $A \cap B = A \cap C$, then B=C
   (b) If $A \cup B = B$ for all any set B, then $A = \phi$

2. **(10 points)** Determine whether the following statements are tautology

   (a) $\sim P \Rightarrow (p \Rightarrow q)$

   (b) $(p \Rightarrow q) \wedge (p \vee q)$

3. **(15 points)** Let A={a, b, c, d}, and R={(a, d), (c, a), (c, b), (c, c), (d, b)}
   (a) Construct the diagraph of R
   (b) Show the corresponding matrix M_R and then compute M_{R^2}
   (c) Give the transitive closure of R

4. **(10 points)** Let S = {1, 2, 3, 4, 5} and A=S×S. Define the following relation R on A: (a, b) R (a', b') if and only if b=b'.
   (a) Show that R is an equivalence relation
   (b) Compute A/R
5. **(10 points)** Let A={1, 2, 3, 4, 5, 6} and

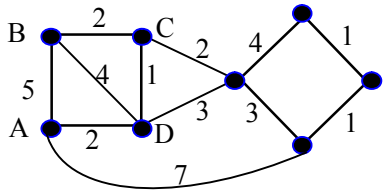
$$p = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 3 & 1 & 2 & 5 & 4 & 6 \end{pmatrix}$$

   be a permutation of A
   (a) Write p as a product of disjoint cycles;
   (b) Compute p^{-1} and p^2.

6. **(10 points)** A={2, 3, 4, 6, 12, 18, 36} with the partial order of divisibility
   (a) Draw the corresponding Hasse diagram;
   (b) Determine the greatest, least, maximal and minimal elements, if they exist, of the poset.

7. **(15 points)** Consider the completely parenthesized expression (a + b) × (c÷(d-e))
   (a) Show a tree representation of the expression;
   (b) Travel the tree in (a) using POSTORDER algorithm;
   (c) Let a=1, b=2, c=3, d=4, e=3, calculate the expression (a + b) × (c ÷ (d-e)) according to the string obtained in (b) step by step.

8. **(10 points)** Consider the following weight graph



   (a) Use Prim's Algorithm to find a minimal spanning tree (start at vertex A)
   (b) Use Kruskal's Algorithm to find a minimal spanning tree

9. **(10 points)** consider the following graphs

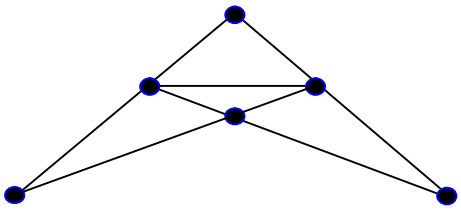


Fig. 1

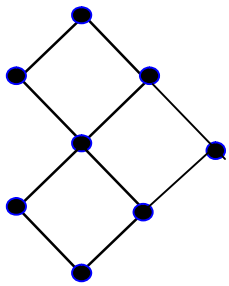


Fig. 2

   (a) Determine which of the graphs has a Euler circuit, and give reasons for your choice;
   (b) Use Fleury's algorithm to produce an Euler circuit for the graph in (a)