



**PHILADELPHIA UNIVERSITY**  
**DEPARTMENT OF BASIC SCIENCES**

**Second Exam A**

**DISCRETE STRUCTURES**

**06-05-2009**

Part 1 Each problem is worth 2 points. Circle one answer.

- 1) Let  $A = \{2,3,5,7\}$  and  $R = \{(a,b) \mid a + b = \text{odd}\}$ . Which property is true?  
a) reflexive    b) symmetric    c) transitive    d) all these are true

- 2) Which matrix represents an equivalence relation?

a)  $\begin{bmatrix} 1 & 1 & 0 & 1 \\ 0 & 1 & 1 & 0 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 \end{bmatrix}$     b)  $\begin{bmatrix} 0 & 1 & 1 & 1 \\ 1 & 0 & 1 & 1 \\ 1 & 1 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{bmatrix}$     c)  $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 1 \\ 0 & 1 & 1 & 1 \end{bmatrix}$     d)  $\begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 0 \\ 0 & 1 & 1 & 0 \\ 1 & 0 & 0 & 1 \end{bmatrix}$

- 3) Let  $R = \{(1,2), (2,3), (2,4), (3,1), (4,1)\}$ . Find  $R^2$ .  
a)  $\{(1,3), (2,1), (3,2), (4,2), (4,3)\}$     b)  $\{(1,3), (1,4), (2,1), (3,2), (4,2)\}$   
c)  $\{(1,2), (2,3), (2,4), (3,1), (4,1)\}$     d)  $\{(1,3), (2,4), (2,3), (3,1), (4,2)\}$

- 4) A complete graph has 91 edges. How many points does it have?  
a) 16    b) 24    c) 14    d) 20

- 5) Which graph is an Euler circuit?  
a)  $K_4$     b)  $K_{2,5}$     c)  $K_7$     d)  $K_{3,3}$

- 6) Convert the incidence matrix  $\begin{bmatrix} 1 & 1 & 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 1 & 0 & 1 \end{bmatrix}$  to adjacency matrix.

a)  $\begin{bmatrix} 2 & 0 & 1 \\ 0 & 0 & 2 \\ 1 & 2 & 1 \end{bmatrix}$     b)  $\begin{bmatrix} 2 & 0 & 2 \\ 0 & 0 & 1 \\ 2 & 1 & 1 \end{bmatrix}$     c)  $\begin{bmatrix} 2 & 1 & 1 \\ 1 & 0 & 2 \\ 1 & 2 & 0 \end{bmatrix}$     d)  $\begin{bmatrix} 2 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 0 \end{bmatrix}$

Part 2 Each problem is worth 4 points. Write complete solution.

- 7) Let  $A = \{3, 6, 12, 18, 36\}$  and  $R = \{(a, b) \mid b \bmod a = 0\} \subseteq A \times A$ . Find the elements of  $R$  and draw the Hasse diagram.  
8) Find the output using the algorithm (a) pre-order (b) post-order (c) in-order.

