

PHILADELPHIA UNIVERSITY
DEPARTMENT OF BASIC SCIENCES

Discrete Structures	(210104)	Paper:	Final Exam (A)
Discrete Mathematics	(210242)	Date:	7 February 2007
Discrete Mathematics	(250151)	Name:	

Part One **Each problem is worth 2.5 points.**

- 1) Which proposition is a tautology?
 (a) $p \rightarrow (p \vee q)$ (b) $p \rightarrow (p \wedge q)$
 (c) $p \rightarrow \neg p$ (d) $(p \rightarrow p) \rightarrow (q \wedge \neg q)$

- 2) Which proposition is false?
 (a) $\forall x \exists y (x + y = y)$ (b) $\exists x \forall y (x + y = y)$
 (c) $\exists x \forall y (xy = y)$ (d) $\forall x \exists y (xy = y)$

- 3) Convert the decimal number 234 to octal.
 (a) 376 (b) 378 (c) 352 (d) 355

- 4) Evaluate $\text{GCD}(234, 432)$.
 (a) 0 (b) 6 (c) 16 (d) 18

- 5) Suppose $A \subseteq B$. Which of the following must be true?
 (a) $A \oplus B = \phi$ (b) $A - B = B - A$
 (c) $(A \oplus B) - A = B$ (d) $(A \cap B) - B = \phi$

- 6) Suppose $|S| = 8$. How many subsets of S contain more than 5 elements?
 (a) 56 (b) 93 (c) 37 (d) 28

- 7) Let $A = \{2, 4, 5, 10\}$. Which relation R is an equivalence relation?
 (a) $R = \{(a,b) \mid a \bmod 2 = b \bmod 2\}$ (b) $R = \{(a,b) \mid a \bmod 2 \neq b \bmod 2\}$
 (c) $R = \{(a,b) \mid a \bmod b = 0\}$ (d) $R = \{(a,b) \mid a \bmod b = 2\}$

- 8) Which is the transitive closure of the relation given by $\begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 1 \end{bmatrix}$?

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

- 9) A complete graph has 36 edges. What is the number of points (vertices)?
 (a) 9 (b) 8 (c) 5 (d) 6

- 10) A graph has degree sequence 0, 2, 1, 3, 1, 1, 4. Find its degree.
 (a) 40 (b) 46 (c) 48 (d) 12

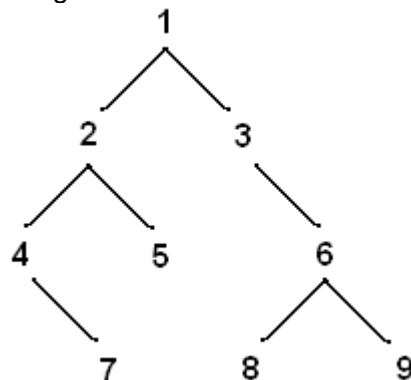
11) Convert the incidence matrix $\begin{bmatrix} 1 & 0 & 0 & 1 & 1 \\ 0 & 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 1 & 1 \end{bmatrix}$ to adjacency matrix.

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

12) For the graph $K_{2,5}$ which of the following is true?
 (a) planar, not Euler path (b) planar and Euler path
 (c) not planar, not Euler path (d) Euler path, not planar

Part Two Each problem is worth 5 points

- 13) How many permutations using the letters {A, C, E, M, N, S, T} which do not contain the word CATS or the word MEN?
- 14) Let $A = \{2, 4, 6, 24, 36\}$ and $R = \{(a,b) \mid a \text{ divides } b\}$. Find the elements of R and draw the Hasse diagram.
- 15) For the labeled binary tree find the output using (a) pre-order (b) post-order (c) in-order traversal algorithm.



16) For the weighted graph find a minimum spanning tree and calculate its sum.

