



PHILADELPHIA UNIVERSITY
DEPARTMENT OF BASIC SCIENCES

Final Exam

DISCRETE STRUCTURES

4-2-2006

Part 1: Multiple Choice, each problem is 2 points.

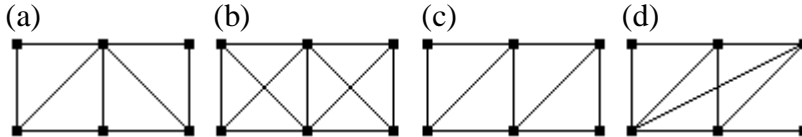
- Which proposition is a tautology?
(a) $p \rightarrow (p \wedge q)$ (b) $(p \rightarrow q) \rightarrow p$
(c) $p \rightarrow (p \vee q)$ (d) $(p \vee q) \rightarrow p$
- Convert the proposition $(\neg p \wedge q) \vee (\neg p \wedge \neg q)$ to a CNF.
(a) $(\neg p \vee q) \wedge (\neg p \vee \neg q)$ (b) $(\neg p \vee \neg q) \wedge (p \vee \neg q)$
(c) $(p \vee \neg q) \wedge (p \vee q)$ (d) $(p \vee q) \wedge (\neg p \vee \neg q)$
- Let $P(x,y) : x^2 - y \geq 0$. Which proposition is false?
(a) $\exists x \forall y P$ (b) $\exists y \forall x P$ (c) $\forall x \exists y P$ (d) $\forall y \exists x P$
- Convert the binary number 1101011101 to hexadecimal.
(a) B5D (b) C5D (c) D71 (d) 35D
- Evaluate $\text{GCD}(233, 377)$.
(a) 0 (b) 1 (c) 2 (d) other answer
- If $|A| = 2$ and $|B| = 3$ then $|P(A \times B)| =$
(a) 64 (b) 36 (c) 32 (d) 720
- What is the minimum number of people so that at least 20 will have birthdays in the same months?
(a) 241 (b) 229 (c) 227 (d) other answer
- Suppose $|A| = 9$. How many different subsets of A which contain 6 elements?
(a) 720 (b) 84 (c) 504 (d) 6
- Which of the following relations is not transitive?
(a) $\begin{bmatrix} 1 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ (c) $\begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 1 & 1 & 1 \end{bmatrix}$ (d) no right answer
- Which graph is not a tree?
(a) K_2 (b) $K_{1,2}$ (c) $K_{3,1}$ (d) $K_{2,2}$



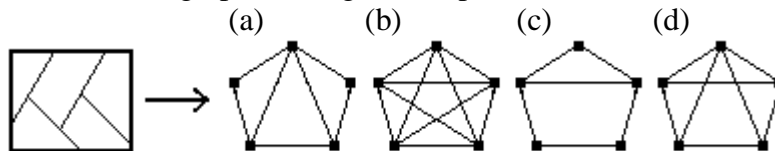
11. Which degree sequence is not valid?

- (a) (1,2,1,2) (b) (0,0,2,0,1)
 (c) (1,1,1,1,1,1) (d) (1,0,0,1,0,1)

12. Which graph is an Euler path but not circuit?



13. Which one is the dual graph of the given map?



Part 2: Each problem is 4 points.

- How many positive integers ≤ 500 are not multiples of 8 or 12 or 20?
- Let $A = \{2, 3, 6, 12, 18\}$ and R be a partial order relation defined by $R = \{(a,b) \mid a \text{ divides } b\}$. Find the elements of R and draw the Hasse diagram.

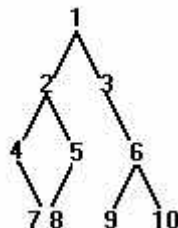
3. Find the zero-one matrix for the transitive closure of

$$\begin{bmatrix} 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix}$$

4. Convert this incidence matrix to an adjacency matrix.

$$\begin{bmatrix} 1 & 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 & 1 \end{bmatrix}$$

- Find the output using
 (a) post-order
 (b) in-order
 traversal algorithms.



- Draw the minimal spanning tree and calculate its total weight.

