



PHILADELPHIA UNIVERSITY
DEPARTMENT OF BASIC SCIENCES

Final Exam A

DISCRETE STRUCTURES

18-01-2012

PART (I) Each problem is worth 2 points. Circle one answer.

1) Convert the decimal number 2120 to octal.

- a) 3734 b) 4066 c) 4110 d) 4242

2) Evaluate GCD (396, 168).

- a) 3 b) 6 c) 12 d) 21

3) Convert the proposition $(p \wedge \neg q) \vee (\neg p \wedge \neg q)$ to CNF.

- a) $(p \vee \neg q) \wedge (\neg p \vee \neg q)$ b) $(p \vee q) \wedge (\neg p \vee \neg q)$
c) $(p \vee \neg q) \wedge (\neg p \vee q)$ d) $(p \vee q) \wedge (\neg p \vee q)$

4) Given $R = \{ (1,4), (2,3), (3,1), (4,2) \}$, find R^3 .

- a) $\{ (1,1), (2,2), (3,3), (4,1) \}$
b) $\{ (1,3), (2,4), (3,2), (4,1) \}$
c) $\{ (1,3), (2,1), (3,4), (4,2) \}$
d) $\{ (1,4), (2,2), (3,3), (4,4) \}$

5) Let $A = \{1,2,3,4\}$ and $R = \{(a,b) \mid a - b > 1\}$. Which one is correct?

- a) symmetric (T); anti-symmetric (F); transitive (F)
b) symmetric (T); anti-symmetric (F); transitive (T)
c) symmetric (F); anti-symmetric (T); transitive (T)
d) symmetric (F); anti-symmetric (F); transitive (F)

6) Which relation is a total order?

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

7) How many permutations with A, B, C, D, E, F do not have BAG or ED ?

- a) 582 b) 674 c) 4224 d) 4806

8) Which graph has adjacency matrix $\begin{bmatrix} 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 \\ 1 & 1 & 0 & 0 \\ 1 & 1 & 0 & 0 \end{bmatrix}$?

- a) C4 b) P4 c) K2,2 d) K1,3

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

- a) $\begin{bmatrix} 0 & 2 & 1 & 1 \\ 2 & 0 & 1 & 3 \\ 1 & 1 & 0 & 2 \\ 1 & 3 & 2 & 0 \end{bmatrix}$ b) $\begin{bmatrix} 0 & 2 & 1 & 1 \\ 2 & 0 & 1 & 1 \\ 1 & 1 & 0 & 2 \\ 1 & 1 & 2 & 0 \end{bmatrix}$ c) $\begin{bmatrix} 0 & 1 & 2 & 1 \\ 1 & 0 & 1 & 2 \\ 2 & 1 & 0 & 1 \\ 1 & 2 & 1 & 0 \end{bmatrix}$ d) $\begin{bmatrix} 0 & 1 & 1 & 1 \\ 1 & 0 & 2 & 2 \\ 1 & 2 & 0 & 2 \\ 1 & 2 & 2 & 0 \end{bmatrix}$

10) Which graph has the biggest chromatic number?

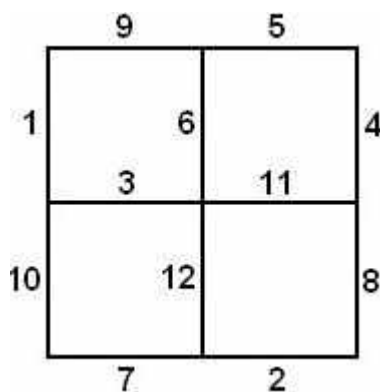
- a) K4,4 b) C7 c) C8 d) P7

PART (II) Each problem is worth 5 points. Write complete solutions.

11) Make the truth table for the proposition $(p \oplus q) \leftrightarrow (r \rightarrow p)$.

12) How many integer solutions ≥ 0 for the equation $x + y + z = 10$ such that $x \geq 2$ or $y \geq 3$ or $z \geq 4$?

Problems (13) and (14) concern the following graph.



13) Find the Minimal Spanning Tree.

14) Solve the Chinese Postman Problem.