

PHILADELPHIA UNIVERSITY DEPARTMENT OF BASIC SCIENCES

## Final Exam ADISCRETE STRUCTURES30-05-2012

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

1) Which proposition is equivalent to  $\neg p \lor \neg q$ ?

a)  $q \rightarrow p$  b)  $p \rightarrow q$  c)  $p \rightarrow \neg q$  d)  $\neg q \rightarrow p$ 

2) A = {1, 2, 3, 4, 5} and B = {2, 4, 6} and C = {1, 2, 3}. Which set is {2, 5, 6} ?

a) (A – B) ⊕ C	b) (C − B) ⊕ A
c) (A − C) ⊕ B	d) (B − A) ⊕ C

3) Which matrix represents an equivalence relation?

a)	$\begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}$	0 1	1 0	b)	$\begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}$	1 1 1	0 1 1	c)	$\begin{bmatrix} 0\\0\\1 \end{bmatrix}$	0 0	$\begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$	d)	$\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$	0 1	$\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$	
	[1	0	1		0	1	1		[1	0	0		[1	0	1]	

4) Let  $R = \{ (1,4), (2,3), (3,1), (4,2) \}$ . Which matrix represents  $R^2$ ?

	0	0	0	1		0	1	0	0		0	1	0	0	d)	1	0	0	0
2)	0	0	1	0	b)	1	0	0	0	c	0	0	1	0	d)	0	0	0	1
a)	0	0	1	0	0)	0	0	0	1	0)	0	0	0	1	u)	1	0	0	0
	0	0	0	1		0	0	1	0		1	0	0	0		0	0	0	1

- 5) How many non-negative integer solutions to A + B + C + D = 12 with the conditions that  $A \ge 5$  and  $B \ge 3$ ?
  - a) 10 b) 20 c) 35 d) 56
- 6) How many permutations with A, B, C, D, E, F which do not contain "FED" ?
  - a) 96 b) 114 c) 600 d) 696
- 7) Which graph is an Euler circuit?
  - a) K5 b) K2,5 c) K3,4 d) K4

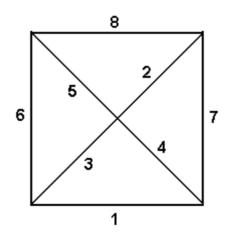
8) Which graph has adjacency matrix $\begin{bmatrix} 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 \\ 1 & 1 & 0 & 0 \\ 1 & 1 & 0 & 0 \end{bmatrix}$ ?											
a) (	24	b)	P4	c)	K2,2	d)	K1,3				
9) Convert	the inc	cidence	matrix	$\begin{bmatrix} 1 & 1 \\ 0 & 0 \\ 1 & 0 \\ 0 & 1 \end{bmatrix}$	$\begin{bmatrix} 0 & 0 \\ 1 & 1 \\ 0 & 1 & 0 \\ 0 & 1 \end{bmatrix}$	to dis	tance r	natrix.			
a)	$\begin{bmatrix} 0 & 2 \\ 2 & 0 \\ 1 & 1 \\ 1 & 3 \end{bmatrix}$	$   \begin{bmatrix}     1 & 1 \\     1 & 3 \\     0 & 2 \\     2 & 0   \end{bmatrix} $	b)	0 2 2 0 1 1 1 1	$   \begin{bmatrix}     1 & 1 \\     1 & 1 \\     0 & 2 \\     2 & 0   \end{bmatrix} $	c) $\begin{bmatrix} 0\\1\\2\\1 \end{bmatrix}$	$ \begin{array}{cccc} 1 & 2 \\ 0 & 1 \\ 1 & 0 \\ 2 & 1 \end{array} $	$\begin{bmatrix} 1\\2\\1\\0 \end{bmatrix} d)$	$\begin{bmatrix} 0 & 1 \\ 1 & 0 \\ 1 & 2 \\ 1 & 2 \end{bmatrix}$	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{bmatrix} 1 \\ 2 \\ 2 \\ 0 \end{bmatrix}$

10) Which graph has diameter 3?

a) K5	b) C7	c) K4,3	d) P5
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**PART (II)** Each problem is worth 4 points. Write complete solutions.

- 11) Convert the proposition  $(p \oplus q) \rightarrow r$  to CNF.
- 12) How many integers from 1 to 1000 are multiples of 8 or 28?
- 13) Evaluate GCD (987, 654).
- 14) Let A =  $\{2, 3, 10, 20, 30\}$  and R =  $\{(a,b) | b \mod a = 0\}$ . Draw the Hasse diagram.
- 15) Solve the Chinese Postman Problem (CPP) for the graph below.



-Amin Witno