PHILADELPHIA UNIVERSITY
DEPARTMENT OF BASIC SCIENCES

Final Exam A **DISCRETE STRUCTURES** **07–06–2011**

PART (I) Each problem is worth 3 points. Circle one answer.

1) Which proposition is a contingency?

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

2) Which function f(n) gives the sequence 0, 1, 4, 5, 8, 9, ... ?

   a) $n - \lfloor n \div 2 \rfloor \times 2$ b) $1 + \lfloor n \div 2 \rfloor \times 2$
   c) $n + \lfloor n \div 2 \rfloor \times 2$ d) $1 + \lfloor n \div 2 \rfloor \times n$

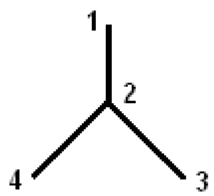
3) Given A = {1,2,3,4} and R = { (a,b) | a mod b < 2 }. Then R is

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

4) Which equivalence relation has equivalence classes {1, 2, 5} and {3, 4}?

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

5) Convert the Hasse diagram to matrix.



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

6) How many positive integers up to 100 are not multiples of 4 or 5?

a) 40 b) 43 c) 57 d) 60

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

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

8) A complete graph has 153 edges. How many points does it have?

a) 16 b) 17 c) 18 d) 19

9) Which graph is an Euler circuit?

a) $K_{2,7}$ b) K_7 c) $K_{5,5}$ d) K_{10}

10) Which graph has the largest degree?

a) $K_{10,1}$ b) $K_{5,6}$ c) P_{22} d) C_{11}

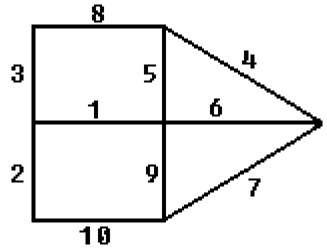
PART (II) Each problem is worth 5 points. Write complete solutions.

11) Convert the proposition $(p \oplus q) \rightarrow \neg r$ to a CNF.

12) Convert the decimal number 438 to binary and to octal.

13) How many permutations with the elements {A, B, D, E, M, N, O, R} which have the word ROAD or MEN?

14) Draw the minimal spanning tree and find the total cost.



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