PHILADELPHIA UNIVERSITY
DEPARTMENT OF BASIC SCIENCES

Final Exam A **DISCRETE STRUCTURES** **27–01–2010**

PART (I) Each problem is worth 2½ points. Circle one answer.

1) The proposition $(p \wedge q) \rightarrow \neg p$ is a

   a) tautology b) contrapositive
   c) contingency d) contradiction

2) Convert the proposition $(p \vee \neg q) \wedge (\neg p \vee \neg q)$ to a DNF.

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

3) Convert the binary number 110101 to decimal.

   a) 43 b) 45 c) 51 d) 53

4) Evaluate GCD (643, 436).

   a) 1 b) 2 c) 4 d) bigger than 4

5) There are 8 Faculties at Philadelphia University. What is the minimum number of students to have at least 13 of them in the same Faculty?

   a) 89 b) 97 c) 105 d) 113

6) How many different permutations we have from the elements A, B, C, A, B, A, A?

   a) 35 b) 105 c) 140 d) 210

7) Let A = {1, 2, 3, 4}. Describe the relation R = {(a,b) | a + b is odd}.

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

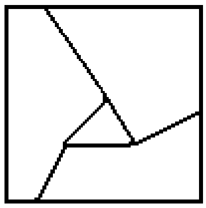
8) Which graph has order 60?

   a) K5,4 b) K5 c) K5,6 d) K6

9) Find the transitive closure of the relation given by $\begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 1 & 0 & 1 \end{bmatrix}$.

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

10) Find the chromatic number for the following map.



a) 2 b) 3 c) 4 d) 5

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

11) Let A = {3, 5, 7, 10, 11, 17} and R = {(a,b) | a mod 3 = b mod 3}.

a) Find the elements of R.
b) Draw the digraph of R.
c) Prove that R is an equivalence relation.
d) Find the equivalence classes.

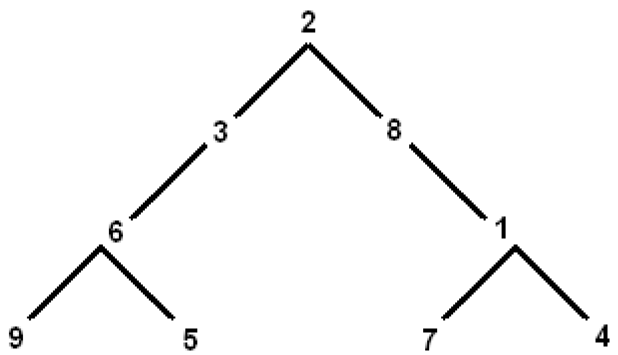
12) Convert the decimal number 2989 to octal.

13) How many positive integers up to 200 are multiples of 8 or 18 or 30?

14) Prove: If $x^2 - 4x + 7$ is odd then x is even.

15) Find the output using different algorithms.

a) pre-order
b) post-order
c) in-order



-Amin Witno