PHILADELPHIA UNIVERSITY
DEPARTMENT OF BASIC SCIENCES

Final Exam A **DISCRETE STRUCTURES** **25–01–2011**

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

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

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

2) Convert the hexadecimal number AE9 to decimal.

   a) 2703 b) 2718 c) 2793 d) 2808

3) Which set is equal to $A \cap B$?

   a) $(A \oplus B) \oplus (A \cup B)$ b) $(A \oplus B) \oplus (A - B)$
   c) $(A \oplus B) \oplus (A \cap B)$ d) $(A \oplus B) \oplus (B - A)$

4) How many permutations with A, B, C, D, E, F which do **not** contain “FACE” ?

   a) 696 b) 714 c) 4920 d) 5016

5) If we have $R = \{(1,3), (2,1), (3,4), (4,1)\}$ then $R^{-2} =$

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

6) The relation R given by its matrix $\begin{bmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 1 & 1 \\ 1 & 1 & 1 & 0 \\ 0 & 1 & 0 & 1 \end{bmatrix}$ is

   a) equivalence relation b) total order
   c) partial order, not total d) not transitive

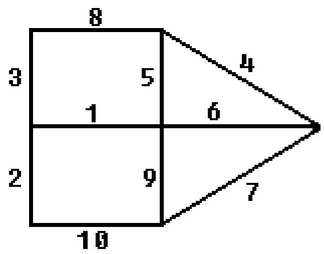
7) Convert the given incidence matrix $\begin{bmatrix} 1 & 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 & 1 \\ 1 & 0 & 0 & 1 & 0 \end{bmatrix}$ to its adjacency matrix.

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

8) Which graph has the least number of edges?

a) K9 b) K3,6 c) K1,9 d) K5,4

9) What is the value of the minimal spanning tree for this graph?



a) 21 b) 22 c) 23 d) 24

10) The Chinese Postman problem for the same graph (Problem 9) has minimum solution with a repetition of edges of total value

a) 10 b) 13 c) 14 d) 16

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

11) Let A = {2, 6, 7, 10, 11, 19} and R = {(a,b) | a mod 3 = b mod 3}.

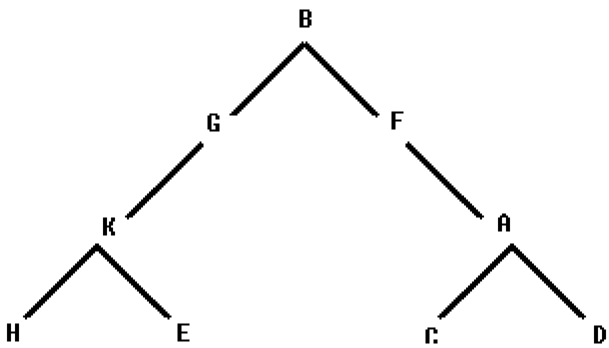
a) Find the elements of R and draw the digraph.
b) Prove that R is an equivalence relation and find the equivalence classes.

12) Evaluate GCD (906, 336) and LCM (906, 336).

13) How many positive integers up to 200 are multiples of 6 or 20?

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

15) Find the output using the algorithm (a) pre-order (b) post-order (c) in-order.



-Amin Witno