PHILADELPHIA UNIVERSITY
DEPARTMENT OF BASIC SCIENCES

Final Exam A **DISCRETE STRUCTURES** **15–06–2008**

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

1) Which proposition is a contradiction?

 a) $(p \oplus q) \leftrightarrow (\neg p \oplus \neg q)$ b) $(p \oplus \neg q) \leftrightarrow (\neg p \oplus q)$
 c) $(p \oplus q) \leftrightarrow (p \oplus q)$ d) $(\neg p \oplus \neg q) \leftrightarrow (p \oplus \neg q)$

2) The number 1969 is decimal. Convert it to hexadecimal.

 a) 7B1 b) 1C1 c) 7CC d) 1BB

3) The set $(A \cup B) \oplus (A \cap B)$ equals

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

4) How many permutations can be formed using the letters {A, B, A, C, A, B, A} ?

 a) 105 b) 35 c) 315 d) 70

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

 a) anti-symmetric is false, transitive is true
 b) symmetric is false, anti-symmetric is false
 c) R is an equivalence relation
 d) R is a total order

6) The transitive closure of the relation {(1,1), (2,3), (2,4), (4,2)} is given by

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

7) A complete graph has 78 edges. How many points does it have?

 a) 13 b) 24 c) 14 d) 28

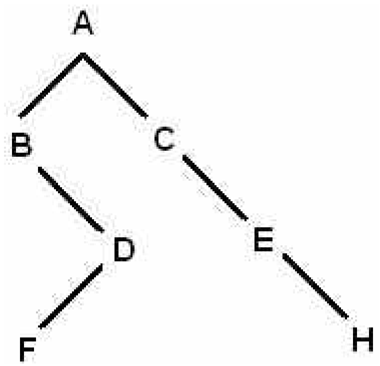
8) Which graph is an Euler circuit?

 a) K4 b) K2,5 c) K9 d) K3,3

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

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

10) Find the output using the in-order algorithm.



a) B-D-F-A-H-E-C
b) F-D-B-A-C-E-H
c) B-F-D-A-C-E-H
d) B-F-D-A-H-E-C

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

11) Evaluate GCD (282, 174) using the Euclidean algorithm.

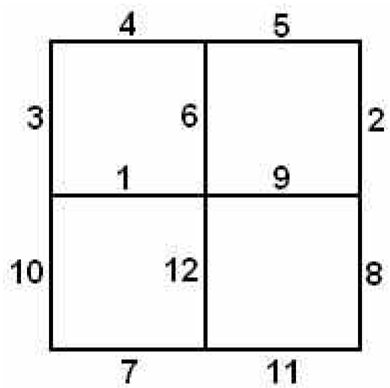
12) Prove: If $x^2 - 10x + 3$ is odd then x is even.

13) Find an explicit formula for the recurrence relation given by

$f(0) = 1$
$f(1) = 2$
$f(n) = 2 f(n-1) + 3 f(n-2)$

14) How many positive integers ≤ 1000 which are not multiples of 25 or 60 ?

15) Draw a minimum spanning tree and find the sum.



-Amin Witno