PHILADELPHIA UNIVERSITY
DEPARTMENT OF BASIC SCIENCES

Final Exam A **DISCRETE STRUCTURES** **02–06–2009**

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

1) Which proposition is a contradiction?

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

2) Convert the octal number 1216 to hexadecimal.

a) 28E b) 29E c) 2AE d) 2BE

3) Evaluate LCM (133, 91).

a) 1309 b) 1463 c) 1547 d) 1729

4) There are 6 chapters in the Discrete Structures notes. How many questions minimum so that at least 9 questions in the Exam come from the same chapter?

a) 49 b) 55 c) 61 d) 67

5) Let A = {1, 2, 3, 4} and R = {(a,b) | a + b > 2}. Then R is

a) symmetric (T), transitive (T) b) symmetric (T), transitive (F)
c) symmetric (F), transitive (T) d) symmetric (F), transitive (F)

6) Let A = {1, 2, 3} and R = {(1,2), (2,3), (3,1)}. Find the transitive closure.

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

7) Which graph has the smallest degree?

a) K10,4 b) K10 c) K7,7 d) K5,9

8) The adjacency matrix $\begin{bmatrix} 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{bmatrix}$ represents which graph?

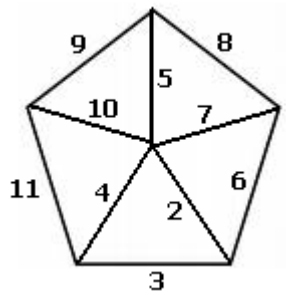
a) K2,2 b) K4 c) K3,1 d) K4,3

9) Which incidence matrix represents a tree?

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

10) Find the minimal spanning tree. The total value is

a) 21 b) 22 c) 25 d) 23



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

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

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

13) How many non-negative integer solutions of $x + y + z = 10$ such that $x \geq 5$ or $y \geq 3$?

14) Give one example of a relation R on A = {1,2,3,4} for each (a) and (b).

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

15) Let A = {1, 6, 8, 11, 12, 18} and R = {(a,b) | a mod 3 = b mod 3}

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

-Amin Witno