



PHILADELPHIA UNIVERSITY
DEPARTMENT OF BASIC SCIENCES

Final Exam A

DISCRETE STRUCTURES

02-06-2010

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

1) Which proposition is equivalent to $p \rightarrow q$?

- a) $p \vee \neg q$ b) $q \vee \neg p$ c) $p \vee q$ d) $\neg p \vee \neg q$

2) Convert the decimal number 2020 to hexadecimal.

- a) 7AE b) 7D4 c) 7E4 d) 7DA

3) If $A = \{1,2,3,4,5\}$ and $B = \{2,4,6\}$ then $|P(A \oplus B)| =$

- a) 8 b) 16 c) 32 d) 64


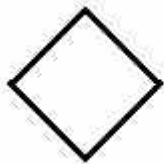


4) If $|A| = 8$, how many subsets have at least 6 elements?

- a) 37 b) 46 c) 61 d) 67

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

- 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) $\begin{bmatrix} 1 & 0 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 & 1 \\ 1 & 0 & 1 & 1 & 0 \\ 1 & 0 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 & 1 \end{bmatrix}$

6) $A = \{4,8,12,24\}$ and $R = \{(a,b) \mid a \bmod b = 0\} \subseteq A \times A$. The Hasse diagram is

- a)  b)  c)  d) 

7) The degree matrix $\begin{bmatrix} 0 & 2 & 1 & 1 \\ 2 & 0 & 1 & 1 \\ 1 & 1 & 0 & 2 \\ 1 & 1 & 2 & 0 \end{bmatrix}$ represents which graph?

- a) K_4 b) $K_{2,2}$ c) $K_{1,3}$ d) P_4

8) Which graph has the largest diameter?

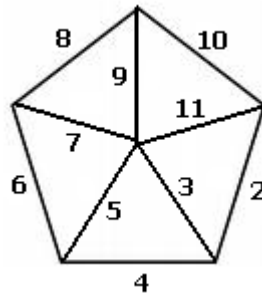
- a) K_{10} b) $K_{6,6}$ c) P_6 d) C_{10}

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

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 $(p \leftrightarrow q) \rightarrow r$ to a CNF.

12) Evaluate $\text{GCD}(2010, 602)$.

13) How many different permutations from the set $\{A, C, E, N, R, S, T\}$ which contain the word TEN or CAR ?

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

15) Solve the Chinese postman problem for this graph.

