

Department of Basic Sciences — Philadelphia University

Final Exam

Discrete Structures

22–01–2018

Part I. (2 points each) Circle one answer from the multiple choice.

1. The proposition $\neg(P \vee \neg Q) \equiv$

- (A) $\neg P \wedge Q$ (B) $P \wedge \neg Q$ (C) $\neg P \vee Q$ (D) $P \vee \neg Q$

2. The set $(A \oplus B) - B =$

- (A) $A - B$ (B) $B - A$ (C) $A \cup B$ (D) $A \cap B$

3. How many non-negative integer solutions for $A + B + C = 10$ with $A \leq 3$?

- (A) 56 (B) 51 (C) 45 (D) 38

4. Let $S(n) = S(n - 1) + \lfloor \frac{S(n-2)}{2} \rfloor$ with $S(0) = 2$ and $S(1) = 3$. Find $S(4)$.

- (A) 3 (B) 5 (C) 7 (D) 9

5. Which matrix represent the relation $R = \{(x, y) \mid x \bmod 2 < y \bmod 2\}$?

- (A) $\begin{bmatrix} 0 & 0 & 0 & 0 \\ 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 \\ 1 & 0 & 1 & 0 \end{bmatrix}$ (B) $\begin{bmatrix} 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix}$ (C) $\begin{bmatrix} 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \end{bmatrix}$ (D) $\begin{bmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \end{bmatrix}$

6. Find the matrix for R^2 , given the relation $R = \begin{bmatrix} 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 \end{bmatrix}$.

- (A) $\begin{bmatrix} 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \end{bmatrix}$ (B) $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$ (C) $\begin{bmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \end{bmatrix}$ (D) $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 \end{bmatrix}$

7. Find the degree of the graph, given the adjacency matrix $\begin{bmatrix} 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{bmatrix}$.

- (A) 6 (B) 8 (C) 10 (D) 12

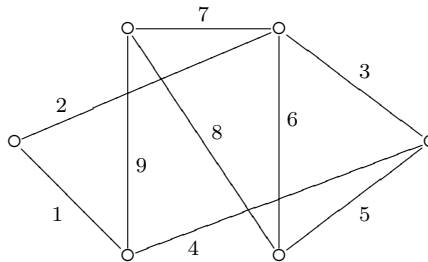
8. What is the chromatic number of $K_{2,4}$?

- (A) 2 (B) 3 (C) 4 (D) 6

9. Which graph is an Euler path?

- (A) K_6 (B) K_4 (C) $K_{5,2}$ (D) $K_{4,3}$

10. Find the total value of the Minimal Spanning Tree for this graph.



- (A) 16 (B) 17 (C) 18 (D) 19

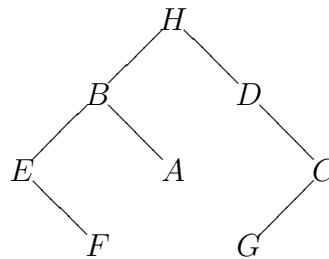
Part II. (4 points each) Write complete solutions.

11. From 1 to 335, how many integers are multiples of 12 or 14 or 20?

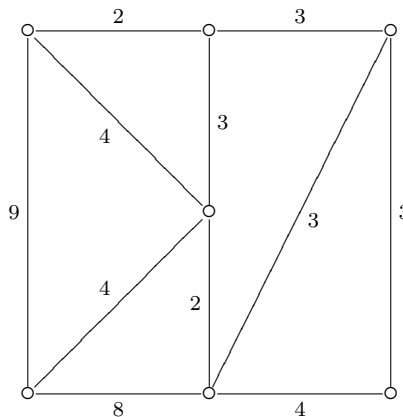
12. Find the formula for the function $S(n)$ given by the recurrence relation:

$$\begin{cases} S(n) = S(n-1) + 12S(n-2) \\ S(0) = 5 \\ S(1) = 3 \end{cases}$$

13. Find the output using (a) pre-order (b) in-order (c) post-order algorithms for the given labeled binary tree.



14. Solve the Chinese Postman Problem for the given graph.



-Amin Witno