



Discrete Mathematics (Math-150)
Level III, Assignment-2
(2016-2017)

Section I

State whether the following statements are true or false: (6 marks)

- 1) A set A has m elements and B has n elements, then the *Cartesian product* of the two sets ($A \times B$) has $m \times n$ elements.
- 2) $\sum_{k=1}^5 3^k = \infty$.
- 3) The bubble sort algorithm puts the list of elements in decreasing order
- 4) In an algorithm, finite number of steps is used to get the desired output.
- 5) $8 +_{11} 9 = 16 \bmod 12$.
- 6) The product of two prime numbers is a composite number.

	1	2	3	4	5	6
Answer						

Section II

Select one of the alternatives from the following questions as your answer. (6 marks)

- 1) If $A = \{a, b, c\}$, then the number of proper subsets of A is
 - A. 5
 - B. 6
 - C. 7
 - D. 8

- 2) Let $\{a_n\}$ be a sequence that satisfies the recurrence relation $a_n = a_{n-1} + 5$ for $n = 1, 2, 3, 4, \dots$ and suppose that $a_0 = 1$. What are a_1 , a_2 and a_3 respectively ?
- A. 6, 11, 16
 - B. 6, 5, 11
 - C. 1, 5, 6
 - D. 1, 6, 11
- 3) Which of these functions is $\Omega(x^2+1000)$.
- A. $f(x)=17x+11$
 - B. $f(x)=x^2$
 - C. $f(x)=x\log x$
 - D. $f(x)=x$
- 4) In Big O notation, if one pair of witnesses is found, then
- A. That pair is unique.
 - B. Two more pairs can be found.
 - C. Three more pairs can be found
 - D. Infinite number of pairs can be found.
- 5) The congruence $30 \equiv 8 \pmod{a}$ holds when a is
- A. 11
 - B. 5
 - C. 8
 - D. 3
- 6) The octal expansion of $(234)_{10}$
- A. $(352)_8$
 - B. $(234)_8$
 - C. $(35)_8$
 - D. $(52)_8$

	1	2	3	4	5	6
Answer						

Section III

Solve the following questions

(3 marks for each)

- 1) Let $U = \{1,2,\dots,8\}$ be a universal set & $A = \{1,2,3,4\}$ and $B = \{2,4,5,7\}$ be subsets of U . Find a) $\bar{A} \cap \bar{B}$ b) $A \times B$ c) $|A \oplus B|$

- 2) Let $f, g : \mathbf{Z} \rightarrow \mathbf{Z}$ be functions such that $f(x) = 2x+3$ and $g(x) = x^2 + 2$.
- a) Show that $f(x)$ is *bijection* function.
- b) Find $(f \circ g)(x)$, $f^{-1}(x)$

3) Let $f(x) = 3x^2 + 4x - 1$. Show $f(x)$ is $O(x^2)$.

4) List all binary search steps used to search for 12 in the sequence
1,4,2,10,7,13,5,12,9

5) Show that the inverse of 50 modulo 8 is not exists.

6) Find the greatest common divisor of 726 and 275 by using the Euclidean Algorithm.

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