

KING SAUD UNIVERSITY

COLLEGE OF COMPUTER & INFORMATION SCIENCES
DEPT OF COMPUTER SCIENCE

CSC281 Discrete Mathematics

Second Semester 1427/1428 AH

Second Mid-term Examination: Monday 20.4.1428 A.H./7.5.2007 C.E. (duration = 2 hours)

Instructor: Dr. Aqil Azmi

Instructions:

- Write your name and id.
 - Answer all the questions.
 - Write your final answer neatly in the designated space. Try showing your computation as much as possible.
 - Use back sheet for scribbling/scratching.
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S/N:

Name:

ID:

1. [Marks 10]

A box contains 10 pens and 10 pencils. A boy selects at random without looking at them.

- a. How many he must select to be sure of having 3 of same type (*i.e.* 3 pens or 3 pencils)? Explain.
- b. How many he must select to be sure of having 2 pens and 1 pencil? Explain.

2. [Marks 10]

What is the coefficient of x^{17} in the expansion of $(x^2 - 1/x)^{40}$.

3. Marks 40]

The English alphabet contains a total of 26 letters (21 consonants and 5 vowels). How many strings of 6 *uppercase* letters of the English alphabet are there

- a. that contain no vowels, if letters can be repeated?
- b. that contain no vowels, if letters are not repeated?
- c. that start with a vowel (rest are consonants), if letters can be repeated?
- d. that start with a vowel (rest are consonants), if letters are not repeated?
- e. that contain exactly one vowel, if letters can be repeated?
- f. that contain at least one vowel, if letters can be repeated?
- g. that contains at most two vowels (rest are consonants), no repeated letters in the string?
- h. that start with letter X and contain exactly one vowel, if letters are not repeated?
- i. is a palindrome?
- j. contains the substring ABC, rest of the string is composed of the letters D, E, ..., Z each occurring no more than once?

4. [Marks 20]

How many positive integers *not* exceeding 100 that is divisible either by 4 or by 6 or by 10? *Note:* $\text{lcm}(4, 6, 10) = 60$. **Hint:** recall the union of three sets.

5. [Marks 10]

Determine if $a_n = n5^n$ is a solution to the recurrence relation $a_n = 10a_{n-1} - 25a_{n-2}$.

6. [Marks 10]

Write the generating function in closed form for the *infinite* sequence: 1, 3, 1, 3, 1, 3, ...

Note: $1/(1 - ax)$ generates the infinite sequence: 1, a , a^2 , a^3 , ...