

Islamic University of Gaza
Computer Engineering Dept.
ECOM2311: Discrete Math.
Dr. Mohammed Alhanjouri



spring 2015-2016
Final exam
Dec 31, 2015
Exam duration: 120 minutes

Student Name \

Student No. \

Q1 (8 pt.)	Q2 (10 pt.)	Q3 (10 pt.)	Q4 (10pt.)	Q5 (12 pt.)	Total (50 pt.)

Q1)

a) [4 pt.]. How many three digit numbers

- 1) are not divisible by 4?
- 2) are divisible by 3 or 4?
- 3) are not divisible by either 3 or 4?
- 4) are divisible by 3 but not by 4?

b) [4 pt.]. What is the minimum number of students, each of whom comes from one of the 50 states, who must be enrolled in a university to guarantee that there are at least 100 who come from the same state?



Q2)

a) [5 pt.]. Write pseudo-code for Recursive Algorithm that calculates Fibonacci value after n numbers.

b) [5 pt.]. Use strong induction to prove that $\sqrt{2}$ is irrational

Q3)

a) [4 pt.]. Assume that the population of the world in 2001 was 6.2 billion and is growing at the rate of 1.25% a year.

- a) Give an explicit formula for the population of the world n years after 2002.
- b) What will the population of the world be in 2022?

b) [6 pt.]. For the following sequence, find a_{40} .

$$a_0 = 5, a_1 = 14, a_2 = 4(a_1 - a_0), \dots$$

Q4)

a) [5 pt.]. Let R_1 and R_2 be the "congruent modulo 3", and the "congruent modulo 4" relations, respectively, on the set of integers. That is, $R_1 = \{(a, b) \mid a \equiv b \pmod{3}\}$ and $R_2 = \{(a, b) \mid a \equiv b \pmod{4}\}$. Find

a) $R_1 \cup R_2$

b) $R_1 \cap R_2$

c) $R_1 - R_2$

d) $R_2 - R_1$

e) $R_1 \oplus R_2$

b) [5 pt.]. a) For each of these relations on the set $\{1, 2, 3, 4\}$, decide whether it is reflexive, symmetric, antisymmetric, transitive, and equivalence relation.

i) $\{(2, 2), (2, 3), (2, 4), (3, 2), (3, 3), (3, 4)\}$

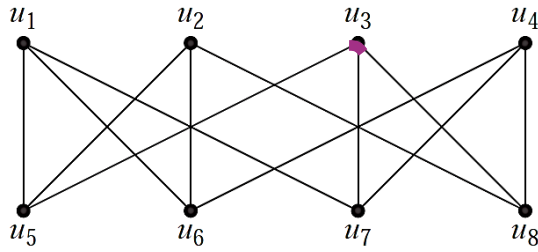
ii) $\{(1, 1), (1, 2), (2, 1), (2, 2), (3, 3), (4, 4)\}$

iii) $\{(1, 2), (2, 3), (3, 4)\}$

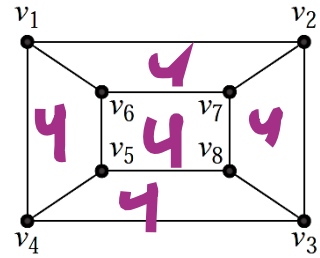
b) Use zero-one matrix to represent the relations (ii), and the digraph to represent the relations (i)

Q5)

a) [6 pt.]. Show if the following two graphs G_1 and G_2 are isomorphic or not. Represent G_2 by Incidence Matrices.



G_1



G_2

e	12	12
v	8	8
$2d$	0	0
$3d$	8	8

b) [6 pt.]. A full balanced m -ary tree (T) has 81 leaves and height 4. What is m ? And determine the numbers of internal nodes, all nodes, and edges.