



Student Name:..... Student No.:.....

- Solve all the following sex Questions.
- This exam should be solved without any book, or notes

Q1) [10 pt.].

a) How many integers from 1000 to 10000 are divisible by 5 but not 7?

b) How many one-to-one functions are there from a set with five elements to sets with the following number of elements?

i) 4

ii) 5

c) What are the coefficients of i^2j^3 and i^3j^2 in the expansion of $(4i+2j)^5$

d) If row of Pascal's triangle containing the binomial coefficients $C(10, k)$, $0 \leq k \leq 10$, is:

1 10 45 120 210 252 210 120 45 10 1

Use Pascal's Identity to find the coefficients of previous row in Pascal's triangle.

Q2) [10 pt.]

a) Find x in the congruence: $34x \equiv 77 \pmod{89}$

b) Write pseudocode to generate sequence of (n) pseudorandom numbers using the linear congruential method? What is time complexity?

Q3) [6 pt.] Use mathematical induction to prove that: $1^3 + 2^3 + 3^3 + \dots + n^3 = \left(\frac{n(n+1)}{2}\right)^2$

Q4) [6 pt.] what is the solution of the Fibonacci recurrence relation: $f_n = f_{n-1} + f_{n-2}$ where $f_0 = 0$, $f_1 = 1$. Find f_{30} ?

Q5) [10 pt.].

a) If the following relations are applied on a and b as below (R^2 is all Real numbers):

$$R_1 = \{(a, b) \in R^2 \mid a > b\}$$

$$R_2 = \{(a, b) \in R^2 \mid a \geq b\}$$

$$R_3 = \{(a, b) \in R^2 \mid a < b\}$$

$$R_4 = \{(a, b) \in R^2 \mid a \leq b\}$$

$$R_5 = \{(a, b) \in R^2 \mid a = b\}$$

$$R_6 = \{(a, b) \in R^2 \mid a \neq b\}$$

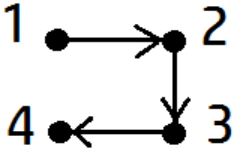
Find: a) $R_2 \cup R_4$ b) $R_3 \cap R_6$ c) $R_3 - R_6$ d) $R_3 \oplus R_5$ e) $R_2 \circ R_1$ f) $R_4 \circ R_1$

b) - How many relations are there on the set $\{0, 1\}$?

- List them? And determine what properties are for each one? Just check the properties for each relation that you think there. (use what you need in table).

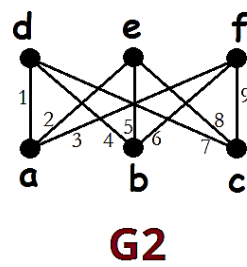
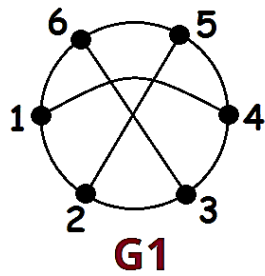
[illegible]

c) Given the relation R on $A = \{1,2,3,4\}$, as $R = \{(1,2),(2,3),(3,4)\}$ as shown in digraph.

$R =$ as in digraph	Draw the digraph that represents transitive closure of relation.
	

Q6) [8 pt.].

- a) Determine if the following two graphs G_1 and G_2 are isomorphic or not, explain your answer.
b) Represent G_2 by Incidence Matrices, and G_1 by Adjacency Matrices



Questions	Q1	Q2	Q3	Q4	Q5	Q6	total
Full Mark	10	10	6	6	10	8	50
St. Degree							