# Arba Minch University;

## Department of mathematics

## Discrete mathematics and combinatorics for software Engineering

With a group of 5 students in alphabetical order

Group work(25%)

part 1: 10%

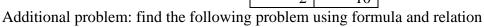
#### Instruction:

- ✓ Write in clear hand writing from group member
- ✓ Prepare with very good cover
- ✓ If you can write in softcopy and send in telegram for me or
- ✓ Scan hard copy of your clear hand writing and send for me OR
- ✓ Submit hard copy before final exam
- √ Submitting date :May 25/22
- 1. Find the solution of the RR  $a_n=3a_{n-1}+10a_{n-2}-24a_{n-3}$  ,  $n\geq 3$  With initial condition

no.	a
0	2
1	5
2	10

2. Find the solution of the RR  $a_n = -5a_{n-1} + 2a_{n-2} + 24a_{n-3}$ ,  $n \ge 3$  With initial condition

no.	a
0	2
1	6
2	10



- a) Find  $a_{20}$
- b) Find  $a_{30}$
- 3. solve the following recurrence relation

 $a_n = 18a_{n-1} - 111a_{n-2} + 278a_{n-3} - 240a_{n-4}$ ,  $n \ge 4$ . With initial condition given as follows

no.	a
0	2
1	30
2	40
3	50

Additional problem: find the following problem using formula and relation

- a) Find  $a_8$
- b) Find  $a_6$
- 4. Find the detail expansion of the binomial  $(a + b)^{20}$  and find
  - a) The coefficient of tenth term
  - b) The coefficient of  $a^{12}b^8$
  - c) Write in expansion form
- 5. From a group of 10 men and 6 women 5 person are to be selected to form a committee so that at least 3 men are there on the committee. In how many ways it can be done
- 6. In how many different ways can the letter of the word "CORPORATION" be arranged so that the letters(vowels)always come together?
- 7. A password consists of 3 letters of the alphabet followed by 3 digits chosen from 0 to 9. Repeats are allowed. How many **different possible passwords are there**?
- 8. Let R be a relation defined on IN by  $R = \{(a,b) : a,b \in IN, a+2b=50.$

Find a) R

b) Dom(R) c) Range(R)

d)  $R^{-1}$ 

- 9. For statements p, q, and r, show that the following compound statements are tautology.
  - a.  $p \Rightarrow (p \lor q)$ .
  - b.  $(p \land (p \Rightarrow q)) \Rightarrow q$ .
  - c.  $((p \Rightarrow q) \land (q \Rightarrow r)) \Rightarrow (p \Rightarrow r)$ .
- 10. Determine the truth value of the following statements.
  - a.  $(\exists x \in \mathbb{R})(x^2 x = 0)$ .
  - b.  $(\forall x \in \mathbb{N})(x+1 \ge 2)$ .
  - c.  $(\exists x \in \mathbb{Q})(3x^2 27 = 0)$ .
  - d.  $(\exists x \in \mathbb{R})(\exists y \in \mathbb{R})(x + y + 3 = 8)$ .
  - e.  $(\exists x \in \mathbb{R})(\exists y \in \mathbb{R})(x^2 + y^2 = 9)$ .
  - f.  $(\forall x \in \mathbb{R})(\exists y \in \mathbb{R})(x + y = 5)$ .
  - g.  $(\exists x \in \mathbb{R})(\forall y \in \mathbb{R})(x + y = 5)$

#### Part II Assignment: recurrence relation and generating function=15%

Solve the RR using Generating function

1. Find the solution of the RR  $a_n = 3a_{n-1} + 10a_{n-2} - 24a_{n-3} + n$ ,  $n \ge 3$  With initial condition

n		$a_n$
	0	2
	1	5
	2	10

2. Find the solution of the RR  $a_n = -5a_{n-1} + 2a_{n-2} + 24a_{n-3} + 4$ ,  $n \ge 3$  With initial condition

n	$a_n$
0	2
1	6
2	10

3. Find the solution of the RR  $a_n = a_{n-1} + 2a_{n-2} + 3$  ,  $n \ge 2$  With initial condition

n		$a_n$
	0	2
	1	2
	2	9

4. Find the solution of the RR  $a_n = a_{n-1} + 2a_{n-2} + 3n$ ,  $n \ge 2$  With initial condition

n		$a_n$
	0	2
	1	6
	2	16

5. Find the solution of the RR  $a_{n+1} = 3a_n - 5(n+1) + 7 * 2^n$ ,  $n \ge 0$  With initial condition

n	a
0	7
1	
2	

6. Find the solution of the RR  $a_n = -5a_{n-1} + 2a_{n-2} + 24a_{n-3} + 4n^2$ ,  $n \ge 3$ 

n		a
	0	2
	1	4
	2	6

