Arba Minch University;

Department of mathematics

Discrete mathematicsand combinatorics for software Engineering

With a group of 5 students in alphabetical order

Group work(25%)

part I: 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 $a_n = -5a_{n-1} + 2a_{n-2} + 24a_{n-3}, n \geq 3$
   With initial condition

no.	a
0	2
1	6
2	10

Additional problem: find the following problem using formula and relation

a) Find a_{20}
b) Find a_{30}

3. solve the following recurrence relation

.$a_n = 18a_{n-1} - 111a_{n-2} + 278a_{n-3} - 240a_{n-4}, n \geq 4$. 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 5person 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. $p \Longrightarrow (p \vee q)$.
   b. $(p \wedge (p \Longrightarrow q)) \Longrightarrow q$.
   c. $\big((p \Longrightarrow q) \wedge (q \Longrightarrow r)\big) \Longrightarrow (p \Longrightarrow r)$.
10. Determine the truth value of the following statements.
    a. $(\exists x \in \mathbb{R})(x^2 - x = 0)$.
    b. $(\forall x \in \mathbb{N})(x + 1 \geq 2)$.
    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 $a_n = 3a_{n-1} + 10a_{n-2} - 24a_{n-3} + n, n \geq 3$
   With initial condition

n	a_n
0	2
1	5
2	10

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

n	a_n
0	2
1	6
2	10

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

n	a_n
0	2
1	2
2	9

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

n	a_n
0	2
1	6
2	16

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

n	a
0	7
1	
2	

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

With initial condition

n	a
0	2
1	4
2	6