Assignment numbers: 3, 4 and 5
Graph Theory and Combinatorics

1. If $4\ {}^{n}P_3 = 5^{n-1}P_3$ find the value of n.

2. Prove that ${}^{n}C_r = {}^{n-1}C_r + {}^{n-1}C_{r-1}$

3. How many different arrangements can be made by taking 5 of the letters of the word UTTARAKHAND?

4. How many different permutations can be made out of the letters of the word "ASSASSINATION" taken all together?

5. Write down the inclusion-exclusion principle.

6. Define Recurrence Relations with the help of one example.

7. Solve the recurrence relation $a_n = 2a_{n-1}$ *with* $a_0 = 1$

8. Solve the recurrence relation**:** $a_{n+2} = 5a_{n+1} - 6a_n + 7^n$.

9. Solve $a_n - 7a_{n-1} + 12a_{n-2} = n.4^n$

10. Solve the following recurrence relation**:** $a_{r+2} - 7a_{r+1} - 8a_r = 2^r r^2$

11. Define Generating functions. Find the generating function of the series 1, 1, 1, 1, 1, 1,?

12. Use method of generating function to solve recurrence relation $a_r - 5a_{r-1} + 6a_{r-2} = 2^r + r, r \geq 2$ with $a_0 = 1, a_1 = 1$.

13. Solve the following difference equation by the method of generating function $a_r - 7a_{r-1} + 10a_{r-2} = 3^r, r \geq 2$ with the boundary condition : $a_0 = 0, a_1 = 1$

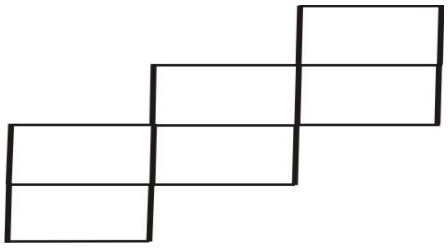
14. Express Fibonacci sequence of numbers 1, 1, 2, 3, 5, 8, 13, 21, 34,…….in term of

    (i) General expression for the r^{th} number a_r

    (ii) Generating Function

Assignment numbers: 3, 4 and 5
Graph Theory and Combinatorics

15. Find Rook's Polynomial for the given board:



16. In how many ways 12 things can be divided equally among 4 peoples.

17. In how many ways can we get an even sum when two dice are rolled?

18. In how many way a 11 football players can be chosen out of 17 player when

    (i) 4 particular players are to be always included.

    (ii) 3 particular players are to be always excluded.

19. Solve the recurrence relation $a_r - 3a_{r-1} + 2a_{r-2} = 0.$

20. Explain Pigeonhole principle. Find the number of students in a class so that 4 of them are born in the same month.

21. Define generating function. Find the numeric function if generating function is

$$A(x) = \frac{x^4}{(1-2x)}.$$

22. Solve the recurrence relation by using method of generating function.

$$a_r - 7a_{r-1} + 10a_{r-2} = 0, \quad \forall \quad r \geq 2,$$

where $a_0 = 10$ and $a_1 = 41.$

23. Define recurrence relations. Solve the recurrence relation $a_{r+2} - 4a_{r+1} + 3a_r = 5^r.$

24. How many different permutations can be made out of the letters of the word "POSSESSION" taken all together?

25. How many different arrangements can be made by taking 5 of the letter of the word "EQUATION"?