M.Sc Semester –III

Assignment

Subject- Mathematics

Course –Discrete Mathematics

Subject Course No.-DEMATH3OLEC4

Total Marks-25

Group-A

Answer any one of the following questions (15 marks)

1. (a) Using principle of inclusion and exclusion count the number of permutations of $\{1,2, \ldots . . n\}$ without fixed points.
   (b) Check whether the statement is true or false with proper justification: The number of spanning tress of the complete graph with n vertices is n^{n-2}.
   (c) Let G be a graph with n vertices. Prove that the following statements are equivalent:
   (i) G is tree.
   (ii) G is connected and has $n-1$ edges.
   (iii) Any two vertices of G are connected by exactly one path.

2. (a) What is the generating function for a sequence of numbers $\{a_0, a_1, \ldots . . , a_n, \ldots\}$? Use it compute the number of n-digit quarternary sequences that have an even numbers of 1's.
   (b) Determine the coefficient of $x^5y^{10}z^5w^5$ in $(x-7y+3z-w)^{23}$.

(c) What is pigeonhole principle ? The integers from 1 to 10 are randomly distributed around a circle. Using pigeonhole principle, prove that there must be three-neighbours whose sum is at least 17.

Group-B

Answer any one of the following questions (10marks)

1. (a) Let $G(V, E)$ be a simple planer graph with $V = \{1,2, \ldots\ldots, n\}$. Prove that $min\{d(i) |\ i = 1, 2, \ldots, n\} \leq 5$, where $d(i)$ is the degree of vertex i.
   (b) Let $G(V, E)$ be a simple graph and contains a vertex of degree 3. Verify: G is Eulerian.
   (c) Let $G(V, E)$ be a simple graph with n vertices. Prove that G has at least two vertices with same degree.

2. (a) Define a planer graph, show that K_5 is a non-planer.
(b) Using the generating function, solve the difference equation

$$y_{n+2} - y_{n+1} - 6y_n = 0, y_1 = 1, y_0 = 2.$$