Roll No. _______ **Code No. Q-4315**

SECOND SEMESTER EXAMINATION 2021-22

M.Sc. Mathematics

Paper - V

Advanced Descrete Mathematics-II

Time : 3.00 Hrs. **Max. Marks : 80**

Total No. of Printed Page : 03 **Mini. Marks : 29**

Note:- Question paper is divided into three sections. Attempt question of all three section as per direction Distribution of marks is given in each section.

Section 'A'

Very short answer question (in few words)

Q.1 Attempt any six questions from the following : 6x2=12

(i) Define string.

(ii) Define type-3 grammer.

(iii) Define Equivalant Machines.

(iv) Write polish notation.

(v) Define complete Graphs.

(vi) Define incidence of graph.

(vii) Define homomorphism finite automata.

(viii) Define spanning subgraph.

(ix) Define circuit.

(x) Define complete Bipartite graph.

Section 'B'

Short answer type question (in 200 words)

Q.1 Attempt any four questions from the following : 4x5=20

(i) Prove that the sum of the degree of all vertices in a graph G is equal to twice the number of edges in G.

(ii) What is the maximum number of vertices in a graph with 35 edges and all vertices are of degree at least ?

(iii) Show that the maximum number of edges in a complete bipartite group of n vertices is $n^2/4$.

(iv) Prove that any tree (with two or more vertices), there are at least two pendant vertices.

(v) Construct a grammer for the language :

$L = \{a^i, b^{2i}, i \geq 1\}$.

(vi) Define Finite State Machine.

(vii) Let $R_1 = aa*, R_2 = a + b* \, and \; R_3 = (a+b)*$ and be regular expression over $\{a, b\}$. find corresponding languages $L(R_i), i = 1, 2, 3$.

Section 'C'

Long answer/Essay type question. **4x12=48**

Q.3 Attempt any four questions from the following questions :

(i) Design a finite state machine M which can add two binary numbers.

(ii) Find the language $L(G)$ over $\{a, b\}$ generated by the grammer $G = (\{a, b\}, \{S, C\}, S, P)$ where P consists of $S \to aCa,\; C \to aCa$ and $C \to b$.

(iii) Show that every tree has either one or two centres.

(iv) Prove that a graph G is a tree of and only of one and only one path between any two vertices of G.

(v) Prove that a connected graph G is an Eular graph of and only if G is the union of some edges disjoint circuits.

(vi) Prove that a simple graph with n vertices and k components can have at most $\frac{(n-k)(n-k+1)}{2}$ edges.

(vii) Prove that if G is self complementry then G has $4k$ or $4k+1$ vertices, where k is an integer.

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