PD-257 CV-19

(512) M.A./M.Sc. Mathematics (Second Semester)

Examination June 2021

ADVANCED DISCRETE MATHEMATICS (II)

Paper - V

Time : Three Hours] **Maximum Marks : 80**

Minimum Passing Marks : 29

Note : Answer the questions from both the Sections as directed.The figures shown at the right side indicate the marks.

SECTION – A

1. Answer the following questions: [1 X 10]

   (a) Define Null graph.

   (b) Define planar graph.

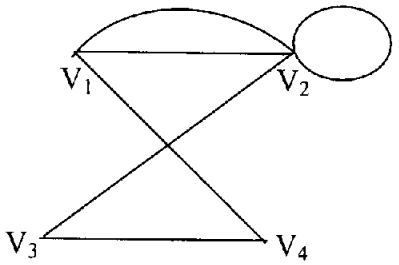
   (c) Define type – 3 grammar.

   (d) Write Euler's formula for connected planar graph with n vertices e edges and r regions.

   (e) Define bainary tree.

   (f) Define equivalent machine.

   (g) Find the adjacency matrix X for the given multigraph.



   (h) Define Regular Grammar.

   (i) Write the following production in BNF

   $S \longrightarrow A$, $S \longrightarrow aB$, $S \longrightarrow aAb$

   (j) A connected graph G is ..... if delation of any edge from G, disconnects the graph G.

2. Answer the following short answer type questions : [2 X 5]

   (a) Define Non-Deterministic Finite Automata.

   (b) Explain Baipartite graph.

   (c) Obtain grammar for language $L = \{a^m b^n : m>n, n>0\}$

   (d) Define Moor machine.

   (e) Define Homeomorphic graph.

SECTION – B

Answer the following questions : [12 X 5]

3. (a) Write short notes on Grammar.

   (b) Construct a grammar for the language $L = \{a^x.b^y : x>y>0\}$

OR

(a) Let G be a grammar with vocabulary V = {S, 0, 1}, set of terminal T = {0, 1} the starting symbol S and the productions are given by $S \longrightarrow 11 < S > 10$. Find L(G).

(b) Design a finite state machine M which can add two bainary number.

4. (a) Let $M = (S, I, O, f, g, s_o)$ be a finite state machine. The relation K-equivalence on the set S of all states of M is an equivalence relation.

(c) Minimize the finite state machine given by the table :

State	Input		Output
	0	1	
A	D	B	1
B	E	B	0
C	D	A	1
D	C	D	0
E	B	A	1

OR

(a) Describe Mealy machine with an example.

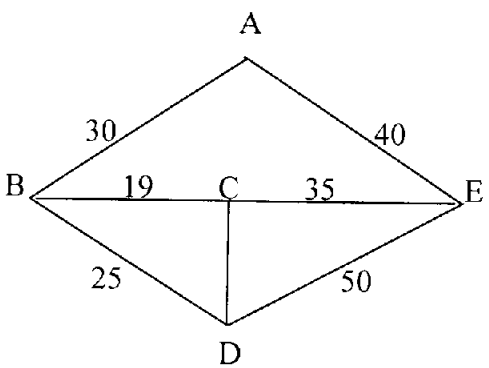
(b) Define Turing machine and construct a Turing machine for adding two non-negative integers.

5. (a) A connected graph G is an Euler graph of and only if G is the unioun of some edges disjoint circuits.

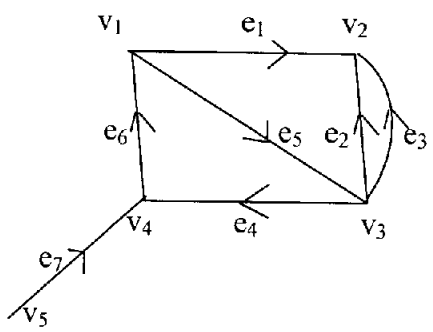
(b) What is the maximum number of vertices in a graph with 35 edges and all vertices are of degree at least 3.

OR

(a) Solve the travelling salesman problem for the following graph:



(b) Define incidence matrix and find incidence matrix of the given digraph:

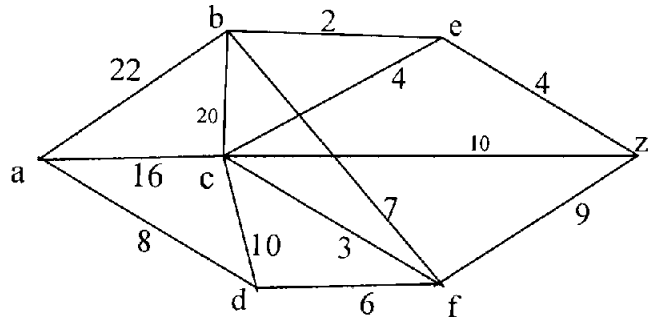


6. State and prove Euler's formula for conected planar graph.

OR

Let G be a simple graph with n vertices if G has K component then the maximum number of edges that can have are $\frac{(n-k)\,(n-k+1)}{2}$

7. Write algorithm for shortest path and find shortest path from a to z in the following graph where number associated with the edges are the weights.



OR

Define spanning tree with example. To prove that "Every connected graph has at least one spanning tree.