MAOEO4

RAMAIAH USN 1MS

Institute of Technology (Autonomous Institute, Affiliated to VTU) (Approved by AICTE, New Delhi & Govt. of Karnataka)

Accredited by NBA & NAAC with'A' Grade

SEMESTER END EXAMINATIONS-MARCH 2022 Program B.E:Common to all Programs :Applied Graph Theo\*y Semester V

Course Name Max. Marks 100 Course Code Duration :MAOE04 :3 Hrs

Instructions to the Candidates:

Answer one full question from each unit.

UNIT I

Define arbitrary traceable graph. Define bipartite and complete bipartite graphs with an example.

a)

b)

CO1 (02) CO1 (04)

Prove that a graph G is Euler if and only if all the vertices of G are of even Co1

(07)

degree.

d)

Define rooted and binary tress and hence prove that: 1 Number of vertices n in a binary tree is always odd  ii) number of pendent vertices is (n+1)/2

CO1 (07)

2 Define Path and circuit of a graph G. CO1 (02)

b) Prove that the number of odd vertices in a graph is always even. CO1

(04)

c) Find (i) Fusion of u4 and us in G1 (ii) Gi U (ii) union of G1 and G2 (iv) CO1

(07)

ring sum of G1 and G2.

U2 1

b

4

G1 G2

P

d) Draw a graph which is CO1 (07) i) Both Hamiltonian and Eulerian

i) Hamiltonian but not Eulerian

ii) Eulerian but not Hamiltonian

iv) Neither Eulerian nor Hamiltonian.

UNIT II

3. Define a weighted graph. CO2 (02) a)

b) Define rank and nullity of a connected graph.

CO2 (04)

C) The following table gives the aerial distance between six cities A, B, C, D, CO2

(07)

E, F. Using Prim's algorithm, find an alir route of shortest distance covering all the cities.

600 C

D

B

A

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700 400

1600 1100 650

500 1150 1400 2000

400 1000 1300 1860 200

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d) Show with an example that with respect to a given spanning tree T of G, a co2 (07) chord that determines a fundamental circuit C occurs in every fundamental cut set associated with the branches in C and in no other.

a) Define a separable graph.

A.

b) Define homeomorphic graphs with an example.

CO2 (02) CO2 (04)

c) State and prove the necessary condition for a simple planar graph G to be Co2 (07) planar and hence prove that Ks is non-planar.

d) Show with an example that ring sum of any two cut sets is again a cut set CO2 (07) or an edge disjoint union of cut sets.

UNIT - III

a) List the properties of incidence matrix of a graph G with an example. CO3 (06) b) Determine the circuit matrix B of the graph given below. Also comment on co3 (07) the rank of B.

c) Write down the fundamental cut-set matrix C, for the following graph. CO3 (07)  Also express C, =[C,: ,] by taking any spanning tree T of G.

V

a) Construct the graph G using the adjacency matrix and also determine X Co3 (13) 6.  Comment on the (1,5)th entry of Xx and give the detailed analysis of the same. o 10 01

|1 0 0 1 0|

x(G)= 00100

0 11 0 1 1

110 1 0 0

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Vinorr1

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b) Write the circuit matrix of the following graph and comment on its rank. CO3 (07)

2

UNIT- IV

7. a) Prove that in a digraph D, the sum of the out-degrees of all vertices is CO4 (04) equal to the sum of in-degrees of all vertices, each sum being equal to the  number of edges in G.

b) Define each of the following with an example: CO4 (08)  i) Asymmetric digraph

i) Complete digraph

ii) Balanced digraph

iv) Connected digraph.

C) Find the fundamental circuit matrix of the following digraph: CO4 (08)

8. a) Define each of the following with an example: CO4 (06)  )Ring sum of two circuits in a diagraph

i) Fundamental cut-set of digraph

il) Euler digraph.

b) Define adjacency matrix of a digraph and list all the properties of the same.  c) Prove that:

i) In an arborescence, there is a directed path from the root to every other vertex.

i) A circuit less digraph G is an arborescence if there is a vertex v in G such that every other vertex is accessible from v and v is not accessible from any other vertex.

UNIT VV

CO4 (07) co4 (07)

9. a) Find the prefix codes for the letter B, E, I, K, L, T, P, S if the coding scheme CO5 (10)  is as shown below

Hence

i) Find the codes for the words PIPE and BEST

ii) Decode the sting 000011100001

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cO5 (10) b) Write a note on:  i) Transport network

i) Maximal flow in a transport network

ii) Cut and its capacity

iv) Max-Flow Min-Cut theorem.

CO5 (12) 10. a) For the electrical network given below,  i) Express the edge current vector in terms of loop current vector

ii) Express the edge voltages in terms of the node voltages

M

lis{t) Valt) alt)

w 0

ioft)

vol

vzlt)

Valt CO5 (08)

b) A transition digraph of three state markov process is given below.

i) Find the transition matrix and P

i) Find P and analyze the result.

0.5 0.

0.6

S3 0.5

\*\*\*\*\*\*\*\*\*\*k \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

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