Course Code: MATH4133
Subject: Introduction to Graph Theory
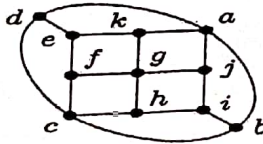
Time Allowed: 100 Minutes.

Max. Marks: 42

Section II (Short Answer)

Q.2- Write short answers of the following.

$$3 \times 6 = 18$$

I). What is Dual Graph give an example?
II). Define Graph Theory.
III). What is $K_{2,4}$ and $B_{2,4}$ define and draw both.
IV). What is difference between Maximal and Maximum Matching?
V). Find $\chi(G)$ of following graphs

G

VI). Construct two different connected structures of a graph having 10 vertices and 15 edges.
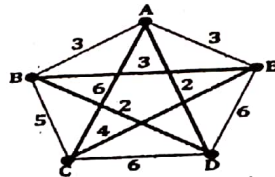
Section III (Essay Type)

Answer the following Questions

$$6 \times 4 = 24$$

Q.3. Find the chromatic polynomial of the following graphs.
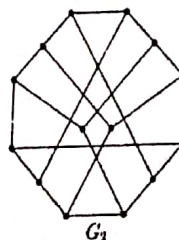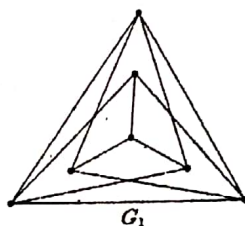
    i) $K_{3,3}$ ii) P_3

Q.4. Solve the Travelling salesman problem for this graph by determining the circuit with minimum total weight.

Q.5. Define Euler and Hamiltonian Graphs. Also give an example of each to support your arguments.

Q.6. State Kuratowski's Theorem. How it is helpful. Check the Planarity and Non planarity of the following graphs.

G_1 G_2

SECTION: I (MCQ's)

Time Allowed: 20 Minutes

Max. Marks: 18

NOTE: Encircle the correct/ best answer in each of the followings. Each Question carries 1 mark. Use of remover carries zero mark. Cutting and Overwriting is not allowed.

Q1.

- Tree is a _____ Graph.
  a) A-Cyclic
  b) Cyclic
  c) not
  d) None

- Chromatic number is the _____ number of colors needed.
  a) Maximum
  b) Minimum
  c) no
  d) None

- A complete graph on n vertices has _____ chromatic number.
  a) 1
  b) 3
  c) n
  d) None

- For Cycle on odd vertices the Chromatic number is _____.
  a) 1
  b) 2
  c) 3
  d) None

- $v - e + f = 2$ is
  a) Euler Formula
  b) Cayley's Formula
  c) Polyhedron Formula
  d) None

- Let G be the non-planar graph with the minimum possible number of edges. Then G has
  a) 9 edges and 5 vertices
  b) 9 edges and 6 vertices
  c) 10 edges and 5 vertices
  d) 10 edges and 6 vertices

- K_4 is
  a) Non Planar
  b) Cyclic
  c) Planar
  d) None

- For Cycle on even vertices the Chromatic number is _____.
  a) 1
  b) 2
  c) 3
  d) None

- If H is subgraph of G then
  a) $\chi(H) \leq \chi(G)$
  b) $\chi(H) \geq \chi(G)$
  c) $\chi(H) = \chi(G)$
  d) None

- Which of the following graph is chromatically equivalent to C_7
  a) K_7
  b) P_7
  c) $K_{6,1}$
  d) None

- The thickness of K_6 is
  a) 0
  b) 2
  c) 1
  d) None

- Maximum number of cut edges possible in a graph G are
  a) n
  b) $n - 1$
  c) $n - 2$
  d) None

- The size of dual graph of C_3
  a) 3
  b) 6
  c) 4
  d) None

- Every complete graph is not a _____ graph
  a) Complete
  b) Non Planar
  c) Planar
  d) None

- The Chromatic number of K_5
  a) 4
  b) 5
  c) 3
  d) None

- The four color problem was proposed in _____
  a) 1952
  b) 1852
  c) 1854
  d) None

- P_3 can be colored in _____ ways by using 3 colors.
  a) 12
  b) 14
  c) 2
  d) None

- The chromatic polynomial of P_3
  a) $k^3 - 2k^2 + k$
  b) $k^3 - k^2 + k$
  c) $k^3 - 2k^2 + 1$
  d) $k^3 - 2k^2 - k$