UNIVERSITY OF NORTH BENGAL

B.Sc. Honours 4th Semester Examination, 2021

SEC2 (P2)-MATHEMATICS

Full Marks: 60

ASSIGNMENT

The figures in the margin indicate full marks.
All symbols are of usual significance.

The question paper contains SEC2A and SEC2B.
The candidates are required to answer any *one* from *two* papers.
Candidates should mention it clearly on the Answer Book.

SEC2A

GRAPH THEORY

GROUP-A

Answer *all* questions 2×5 = 10

1. (a) Find the smallest positive integer n such that the complete graph K_n has at least 500 edges.

   (b) Find the incidence matrix of the graph K_6.

   (c) Does there exist a tree of order 11 such that the sum of the degrees of the vertices is 22? — Justify.

   (d) Find the adjacency matrix of the complete bipartite graph $K_{3,4}$.

   (e) Find the number of spanning trees of K_5.

GROUP-B

10×3 = 30

2. (a) Let G be a disconnected graph of order $2n$ with two components G_1 and G_2. If order of G_1 is $(n-1)$, find the minimum possible size of G. 3

   (b) Find n, for which the complete graph K_n is (i) Semi-Eulerian (ii) Eulerian. 4

   (c) Find the rank of the adjacency matrix of the complete bipartite graph $K_{3,3}$. 3

3. (a) Prove that the order of a self-complementary graph must be of the form $4k$ or $4k+1$, k being a positive integer. 3

   (b) Let G be a simple graph connected graph of order $n \geq 3$ and size m. Prove that G is Hamiltonian if $m \geq \frac{1}{2}(n-1)(n-2)+2$. 5

   (c) Examine, whether a graph having no odd degree vertex is a tree or not? 2

4. (a) Let T_1 be a tree of order n and size 10 and T_2 be another tree of order $4n-1$. Find the size of T_2. 3

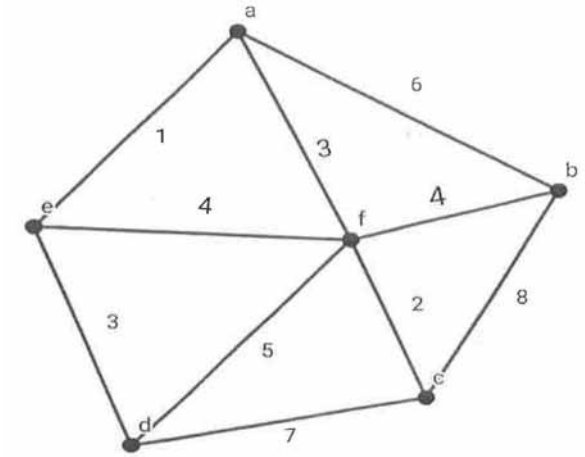
(b) Prove that the complement of a disconnected graph is connected. 4

(c) Give an example of two no isomorphic graphs with same degree sequence. 3

GROUP-C

$5\times2 = 10$

5. (a) Find a minimal spanning tree of the graph shown below. 5



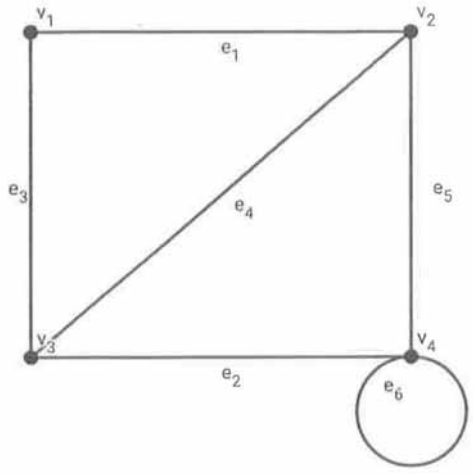
(b) (i) Let G be a 3-regular graph of order $n \geq 8$. Show that the complement of G is Hamiltonian. 2

(ii) Show that the number of edges of a bipartite graph of order n is at most $\frac{n^2}{4}$. 3

GROUP-D

$5\times2 = 10$

6. (a) Find the *adjacency matrix* of the graph with respect to the listing v_1, v_2, v_3, v_4 of the vertices. Hence, find the number of distinct walks of length 2 from v_2 to v_3 and write these walks. 5



(b) (i) Construct a simple graph G with 6 vertices such that G has exactly 5 edges but G is not a tree. 2

(ii) Prove that the complete graph K_n can be expressed as the union of k bipartite graph if and only if $n \leq 2^k$. 3

SEC2B

OPERATING SYSTEM : LINUX

GROUP-A

1. Answer ***all*** questions from the following: 2×5 = 10

   (a) Write any two features of Linux OS.

   (b) What is LILO?

   (c) What is swap space?

   (d) What is active Directory and how it works?

   (e) Differentiate between root user and normal user.

GROUP-B

Answer *all* questions from the following 10×3 = 30

2. Write about the following Linux commands with example:
   cd, cp, pwd, mkdir, rmdir, md, cat, ls

3. Explain the architecture of Linux OS.

4. Explain the concept of shell and kernel? How to view contents of a file in LINUX system?

GROUP-C

5. Answer ***all*** questions from the following: 5×2 = 10

   (a) Define vi Editor and explain its modes. Brief about the commands used in the vi Editor.

   (b) Short note on booting process of the Linux OS.

GROUP-D

6. Answer ***all*** questions from the following: 5×2 = 10

   (a) Explain file system structure of Linux. Explain the pipe feature in Unix with examples.

   (b) Explain the Key features of Linux file system.

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