

UNIVERSITY OF NORTH BENGAL

B.Sc. Honours 4th Semester Examination, 2022

SEC1-P2-MATHEMATICS

Time Allotted: 2 Hours

Full Marks: 60

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

1.	Answer any <i>four</i> questions from the following:	3×4 = 12
	(a) Show that the maximum number of edges in a simple graph with n vertices is	3
	$\frac{1}{2}n(n-1).$	
	(b) Show that if a simple graph G is isomorphic to its complement \overline{G} , then G has either $4k$ or $4k + 1$ vertices for some natural number k.	3
	(c) Prove that every graph with n vertices and k edges has at least $(n-k)$ components.	3
	(d) Show that the number of odd degree vertices in a graph is always even.	3
	(e) Prove that every circuit in a graph contains a cycle.	3
	(f) Draw a graph from the given incidence matrix.	3
	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	

v		0	I	I	I	
w	0	0	0	0	0	
Z	1	0	0	1	1)	

GROUP-B

- 2. Answer any *four* questions from the following:
 - (a) If a simple regular graph has *n* vertices and 24 edges, find all possible values of *n*. 6

 $6 \times 4 = 24$

6

(b) Let G be a graph of order 3 with respect to $V(G) = \{v_1, v_2, v_3\}$. The adjacency 6 matrix A(G) with respect to order set $\{v_1, v_2, v_3\}$ is given below.

Show that *G* is disconnected.

- (c) Let u and v be two non-adjacent vertices in a graph G of order n such that $\deg(u) + \deg(v) \ge n$. Prove that G + uv is Hamiltonian iff G is Hamiltonian.
- (d) Let G be a graph with $n (\ge 2)$ vertices. Then G has at least 2 vertices which are 6 not cut vertices.
- (e) Prove that a simple graph is bipartite iff all its cycles are even. 6
- (f) Draw the graph whose incidence matrix is given by

0	0	1	-1	1
-1	1	0	0	0
0	0	0	0	0
1	0	0	0	-1
0	-1	0	0	0
0	0	-1	1	0

GROUP-C

Answer any two questions from the	following $12 \times 2 = 24$
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- 3. (a) Let G be a p-regular graph of order $n \ge 2(p+1)$ for $p \ge 1$. Prove that the 6+6 complement of G is Hamiltonian.
 - (b) Prove that a connected graph with *n* vertices has at least (n-1) edges.
- 4. (a) Draw the complete graphs K_5 and K_6 . Also find the number of edges in the 6+6 graphs K_{12} and K_{15} .
 - (b) If G is a disconnected graph then prove that \overline{G} is a connected graph.
- 5. (a) For a simple graph G of order $n \ge 3$ and size m, show that for G to be 8+4 Hamiltonian if $m \ge \frac{1}{2}(n-1)(n-2)+2$.
 - (b) Show that a bipartite graph cannot contain an odd cycle.

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- 6. (a) Prove that the maximum number of edges in a simple graph with *n* number of vertices and *k* components can be $\frac{(n-k)(n-k+1)}{2}$.
 - (b) A salesman has to visit five cities namely *A*, *B*, *C*, *D* and *E*. Starting from the home city *A* and visiting each city exactly once, he has to return to the city *A*. The distances from one city to another are given below. Find the optimal route and minimum distance of the route.

	A	В	С	D	Ε
A		4	7	3	4
В	4		6	3	4
С	7	6		8	5
D	3	3	8		8
Е	4	4	5	8	

SEC2B

OPERATING SYSTEM : LINUX

GROUP-A

1.	Answer any <i>four</i> questions from the following:	$3 \times 4 = 12$
	(a) What is boot loader in Linux?	3
	(b) What is a swap area?	3
	(c) Explain the cut command.	3
	(d) What is the core of the Linux Operating System?	3
	(e) Explain command grouping in Linux.	3
	(f) What is meant by Linux disk management?	3

GROUP-B

2.	Answer any <i>four</i> questions from the following:	$6 \times 4 = 24$
	(a) How can you determine the total memory used by Linux?	6
	(b) Write a note on telnet, ftp, rsync and rsh. Why are these services called ins services?	ecure 6
	(c) Explain the following commands with examples: ls, rm, cp, mv, chown, chmod	6
	(d) What are the common things between Linux and UNIX?	6
	(e) Explain the Linux 'cd' command options along with the description.	6
	(f) Enlist the features of the Linux operating system?	6

5+7

GROUP-C

		Answer any two questions from the following	$12 \times 2 = 24$
3.	(a)	Why is Linux considered more secure than other operating systems?	6
	(b)	Write a short note on Linux file permissions.	6
4.	(a)	Enlist some Linux distributors along with its usage.	6
	(b)	How pipes and redirection symbols work? Demonstrate with the help of examples.	6
5.	(a)	Discuss about disk drive partitions in Linux.	5
	(b)	Explain various disk related commands in Linux.	7
6.		Write about the following Linux commands with examples: cal, cd, cp, bc, pwd, mkdir, rmdir, md, cut, Is	12

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