

Total No. of printed pages = 3

CSE 181405

Roll No. of candidate

11/07/23

--	--	--	--	--	--	--	--	--	--

BINA CHOWDHURY CENTRAL LIBRARY
(GIMT & GIPS)
Azara, Hatkhowapara
Guwahati - 781017

2023

B.Tech. 4th Semester End-Term Examination

GRAPH THEORY

(New Regulation (w.e.f. 2017-18)) & (New Syllabus (w.e.f. 2018-19))

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer Question No. 1 and any *four* from the rest.

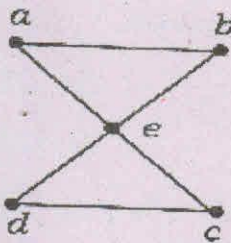
1. Choose the most appropriate choice to answer the following : (10 × 1 = 10)
- (i) A graph is a null graph if and only if it has
- (a) No cycle (b) No vertex
- (c) No edge (d) None of the above is correct answer
- (ii) Adding one edge to a tree defines
- (a) No cycle (b) Exactly one cycle
- (c) At least one cycle (d) At most one cycle
- (iii) Number of edges in a simple tree with N number of vertices is
- (a) N+1 (b) N
- (c) N-1 (d) None above
- (iv) The maximum number of edges possible in a bipartite graph having 12 vertices is :
- (a) 24 (b) 144
- (c) 36 (d) 12
- (v) A regular graph is a graph where each node has
- (a) degree one (b) zero degree
- (c) self loop (d) same degree

[Turn over

- (vi) The complete graph with four vertices (K_4) contains
- (a) 4 vertices and 4 edges (b) 4 vertices and 16 edges
(c) 4 vertices and 6 edges (d) 4 vertices and 12 edges
- (vii) A cycle having n vertices is a planar graph with chromatic number
- (a) 1 (b) 2
(c) 3 (d) N
- (viii) The Number of odd degree vertices in a simple connected graph is
- (a) even (b) odd
(c) zero (d) either odd or even
- (ix) Number of spanning trees that can be formed from a complete graph with 4 vertices :
- (a) 12 (b) 8
(c) 9 (d) 16
- (x) The chromatic number of a tree with n ($n > 2$) vertices is
- (a) 0 (b) 1
(c) 2 (d) n

BINA CHOWDHURY CENTRAL LIBRARY
(GIMT & GIPS)
Azara, Hatkhowapara
Guwahati - 781017

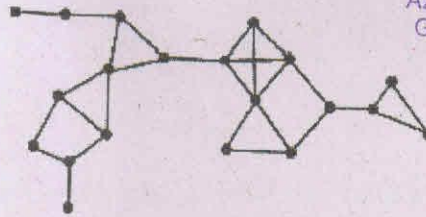
2. Consider the following graph and answer the following questions :



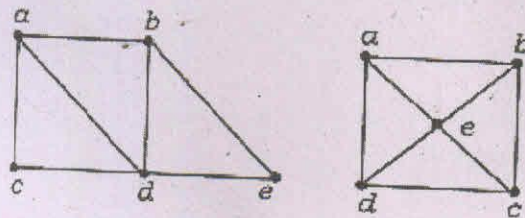
- (a) Compute degree of each vertex. What is the longest path in the graph? Also represent the graph using adjacency list representation. (3+1+6=10)
- (b) What is a directed graph? How do you define degree of vertices in case of a directed graph? (2+3=5)
3. (a) What is a bipartite graph? Give example. Show that a graph is bipartite if and only if it has no odd cycles. (4+6=10)
- (b) "Each tree is a bipartite graph". Justify whether the statement is true or false with proof. (5)

4. Consider the following graph and answer each of the following questions with justification.

BINA CHOWDHURY CENTRAL LIBRARY
(GIMT & GIPS)
Azara, Hatkhowapara
Guwahati - 781017



- (a) What is a cut vertex and what is a bridge? Find the total number of cut vertices in the graph (show all such cut vertices). (4+6=10)
- (b) "An edge 'e' of a connected graph G is a bridge if and only if 'e' is not on any cycle of G" Justify if the statement is true or false with proof. (5)
5. (a) Define a tree and a forest with examples. Prove that every two vertices of a tree have a unique path between them. (4+6=10)
- (b) State and explain briefly the Mengers theorem for disjoint paths in finite graph. (5)
6. (a) Define Eulerian graph and Hamiltonian graph. Prove that a connected multigraph has a Euler circuit if and only if each of its vertices has an even degree. (4+6=10)
- (b) Do the following graphs have Hamiltonian circuit? Justify. (5)



7. (a) What is a planner graph? State the four-color theorem of planar graph. Also state the Euler's Formula on connected planar graph. (2+3+2=7)
- (b) State briefly the Szemerédi's regularity lemma, in graph theory. (5)
- (c) Define matching for an undirected graph with an example. (3)