

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)**

**CLASS: MTECH
BRANCH: COMPUTER SCIENCE**

**SEMESTER : II
SESSION : SP/2023**

SUBJECT: CS601 GRAPH THEORY

TIME: 3 Hours

FULL MARKS: 50

INSTRUCTIONS:

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
 2. Attempt all questions.
 3. The missing data, if any, may be assumed suitably.
 4. Before attempting the question paper, be sure that you have got the correct question paper.
 5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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|--|------|-----|-------|
| Q.1(a) Define Simple Graph with example.
Show that the maximum number of edges in a simple graph with n vertices is $n(n-1)/2$ | [5] | 1 | 1,3 |
| Q.1(b) Draw a graph that becomes disconnected when any of its edge is removed from it
Also prove that such graph is a simple graph and have exactly n-1 edges | [5] | 1 | 1,3 |
| Q.2(a) List out the conditions, that must satisfy for a function to become a metric.
Prove that the distance between the spanning trees of a graph is a metric | [5] | 1,2 | 1,3 |
| Q.2(b) Define different types of Isomorphism.
Given two graphs $G_1 = (V_1, E_1)$ and $G_2 = (V_2, E_2)$
Where $V_1 = \{A, B, C, D, E, F, G\}$, $V_2 = \{A, B, C, D, E, F, G\}$,
$E_1 = \{AB, BC, CD, BD, DE, EF, FG, AG, AE\}$ and $E_2 = \{AB, BC, CD, BD, AE, DE, EF, FG, DG\}$
Are these graphs isomorphic? If so find the level of Isomorphism and the vertex(s) of splits. | [5] | 2 | 3,6 |
| Q.3(a) Draw Kuratowski's graphs and explain their properties.
Given a graph | [5] | 3 | 2,5,6 |
| | | | |
| Is this graph Planar? If so, draw it in Fary's representation (Straight-line representation). | | | |
| Q.3(b) With suitable examples illustrate, Clique, Maximal Clique and Maximum Clique | [5] | 3 | 4 |
| Q.4 List out all the circuits present in the graph given in question 3(a)
Find the circuit matrix for the graph given in question 3(a) | [10] | 4 | 1,6 |
| Q.5(a) What is covering in terms of Graph? Explain with suitable example.
Minimize the Boolean function
$F = w'x'y'z' + w'x'yz' + wx'y'z' + w'x'yz + w'xyz' + w'xyz + wxyz$
using minimal covering of graph. | [5] | 5 | 2,6 |
| Q.5(b) Describe Directed Graphs.
How isomorphism is defined in digraphs? Explain with example.
Define symmetric digraph with an example. | [5] | 5 | 1 |