JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST-3 EXAMINATION- December 2017

B.Tech VII Semester

COURSE CODE: 10B1WCI733                                    MAX. MARKS: 35

COURSE NAME: Graph Algorithms and Applications

COURSE CREDITS: 3                                          MAX. TIME: 2 Hr

*Note: All questions are compulsory.*

1.  [ 2.5 + 2.5 Marks]
a.  Prove or disprove: Every subgraph of a nonplanar graph is nonplanar.
b.  Determine all r, s such that $K_{r,s}$ is planar.

2.  [ 2.5 + 2.5 Marks]
a.  State and prove Euler's theorem for planarity of a graph.
b.  Prove or disprove:  A plane graph has a cut-vertex if and only if its dual has a cut-vertex.

3.  [ 2.5 + 2.5  Marks ]
a.  Prove that a set of edges in a connected plane graph G forms a spanning tree of G if and only if the duals of the remaining edges form a spanning tree of G*.
b.  State and prove Brooks theorem.

4.  [2.5 + 2.5  Marks]
a.  The line graph L (G) of a graph G is given by ....
b.   An interval representation of a graph G is ....

5.  [2.5 + 2.5  Marks]
a.  Let G be a simple graph with diameter at least 4. Prove that complement of G has diameter at most 2.
b.  Prove or disprove: An X, Y bigraph G has a matching that saturates X if and only if $| N(S) | \geq |S|$ for all S $\subseteq$ X. [ $| N(S) |$  denotes the neighbors of  S ]

6.   [2.5 + 2.5  Marks]
a.  Show that if an undirected graph with $n$ vertices has $k$ connected components, then it has at least $n - k$ edges.
b.  Can the graph given below be decomposed into edge-disjoint spanning trees? Into isomorphic edge-disjoint spanning trees?
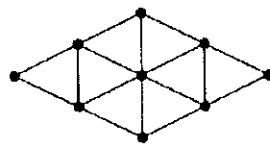


7.   [5 Marks]
Show how to find the *maximum* spanning tree of a graph, that is, the spanning tree of largest total weight.