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Register Number:

DATE: 22-04-2017

**ST. JOSEPH’S COLLEGE (AUTONOMOUS), BANGALORE-27**

**M.Sc. MATHEMATICS – IV SEMESTER**

**SEMESTER EXAMINATION: APRIL 2017**

MT 0214: Graph Theory

Time- 2 ½ hrs Max Marks-70

**This paper contains 2 printed pages.**

**Answer any 7 questions.**

1. a) Find and for the following graphs.



b) Prove that a cubic graph has a cutpoint if and only if it has a bridge. (6+4)

1. a) Define the point connectivity of a graph.

b) What is the line connectivity of a complete graph with  points?

c) Prove that for any graph G, (1+1+8)

1. Prove that every planar graph G, with  has at least four points of degree not exceeding five. (10)
2. Prove that, for any graph G, the sum and product of and satisfy the inequalities,

and. (10)

1. State and prove five color theorem. (10)
2. Let G be a bipartite graph with partite set and such that. Then G contains a matching of cardinality if and only if is neighborly. (10)
3. A graph G is 2-factorable if and only if G is -regular for some positive even integer.

 (10)

1. If T is a strong tournament of order then there exists a vertex v of T such that T-v is a strong tournament. (10)
2. a) Let G be a graph without isolated vertices. If S is a minimal dominating set of G, then prove that V(G)-S is a dominating set of G.

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b) Prove that for every graph G containing no isolated vertices,  where is the total domination number of G. (5+5)

1. Define domination number of a graph. If  is a graph with  points, then prove that  where  is the domination number of and is the maximum degree of. (1+9)