STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI 600 086
(For candidates admitted during the academic year 2015 – 16 & thereafter)

SUBJECT CODE: 15MT/PC/GT34

M. Sc. DEGREE EXAMINATION, NOVEMBER 2018
BRANCH I - MATHEMATICS
THIRD SEMESTER

COURSE : CORE
PAPER : GRAPH THEORY
TIME : 3 HOURS **MAX. MARKS : 100**

SECTION – A (5 X 2 = 10)
ANSWER ALL THE QUESTIONS

1. Define tree. Give an example for a tree on six vertices.
2. If G is k-edge connected, then prove that $\varepsilon \geq \frac{k\nu}{2}$.
3. Find the edge chromatic number of Petersen graph.
4. Show that $K_{3,3}$ is nonplanar using Euler's formula.
5. Define diameter of graph. Give an example.

SECTION – B (5 X 6 = 30)
ANSWER ANY FIVE QUESTIONS

6. Prove that the number of vertices of odd degree in a graph is even.
7. If G is a tree then prove that $\varepsilon = \nu - 1$.
8. If G is a k-regular bipartite graph with $k > 0$ then prove that G has a perfect matching.
9. If G is bipartite to prove that $\chi' = \Delta$.
10. Prove that a set $S \subseteq V$ is an independent set of G if and only if $V \backslash S$ is a covering of G.
11. State and prove Euler's formula.
12. Define three equivalent definitions of kautz digraph. Draw K(2,1) and K(2,2).

SECTION – C (3 X 20 = 60)
ANSWER ANY THREE QUESTIONS

13. Let G be a graph with ν-1 edges prove that the following statements are equivalent.
    (i) G is connected (ii) G is acyclic (iii) G is a tree
14. State and prove Hall's theorem.
15. State and prove Vizing theorem.
16. State and prove Five colour theorem.
17. Explain the basic principles of network design.