M.Sc 1st Semester Examination, 2009

APPLIED MATHEMATICS WITH OCEANOLOGY AND COMPUTER PROGRAMMING

(*Graph Theory*)

PAPER—MA - 1106

Full Marks : 25

Time : 1 hour

Answer **all** questions

The figures in the right-hand margin indicate marks

1. Answer any *two* questions :   2 x 2

   (a) Number of odd degree vertices of a graph is even. Justify.

   (b) Prove that every bipartite graph is 2-chromatic.

   (c) Prove that vertex connectivity of a graph can never exceed its edge connectivity.

2. Answer any *four* questions :   4 × 4

   (a) Show that a tree with n vertices has $n-1$ edges.

   (b) Define a binary tree. Obtain the number of pendant vertices in a binary tree.

   (c) Prove that max vertex connectivity of a graph is $\left[\dfrac{2e}{n}\right]$, where n, e are no. of vertices and edges of a graph respectively.

   (d) Define chromatic polynomial of a graph. Show that the chromatic polynomial of a tree with n vertices is given by $t(t-1)^{n-1}$.

   (e) If a graph G has incidence matrix B and cycle matrix C, then show that

   $$CB^T = 0 \pmod 2.$$

   (f) Prove that in a nonseparable graph G, the set of edges incident on each vertex of G is a cutset.

   [*Internal Assessment* — 5 Marks]