M.Sc. 1st Semester Examination, 2011

APPLIED MATHEMATICS WITH OCEANOLOGY AND COMPUTER PROGRAMMING

PAPER – MTM- 106

(Graph Theory)

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*) Define Chromatic number for a graph G.

(*b*) Show that the number of vertices(n) in a binary tree is always odd.

(*c*) Find the number of edges in a graph with n vertices and no even cycles.

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

(*a*) Show that for a tree G with n vertices, the statements are equivalent :

(*i*) G is connected and circuitless

(*ii*) G is minimally connected graph

(*iii*) G is circuitless and has $(n - 1)$ edges.

(*b*) Show that a graph is bipartite if and only if all its cycles are even.

(*c*) Prove that in a simple connected planar graph with 6 vertices and 12 edges each of the regions is bounded by three edges.

(*d*) Prove that a n vertices graph is a tree iff its chromatic polynomial $P_n(\lambda) = \lambda(\lambda - 1)^{n-1}$ where n is the number of vertices.

(*e*) Define a binary tree. Find the number of pendant vertices of a binary tree with n vertices. Hence show that a binary tree cannot have an even number of vertices.

[*Internal Assessment* – 5 Marks]