2008

APPLIED MATHEMATICS WITH OCEANOLOGY AND COMPUTER PROGRAMMING

(1st Semester Examination)

(Graph Theory)

PAPER—MA-1106

Full Marks : 25

Time : 1 hour

The figures in the right-hand margin indicate marks

Candidates are required to give their answers in their own words as far as practicable

illustrate the answers whenever necessary

1. Answer any *five* questions: 2×5

(*a*) Show that a graph is a tree if and only if it is minimally connected.

(*b*) Show that a connected planar graph with n vertices can not have more than $3n-6$ edges.

(*c*) Define radius and diameter of a graph. Draw a graph whose diameter is not equal to twice the radius.

(*d*) Show that every tree is 2-chromatic.

(*e*) Define cut-set and cut-vertex. Does the existence of a bridge imply the existence of a cut-vertex ?

(*f*) What is the incidence matrix of a simple graph ? Give its two characteristics.

(*g*) Define a regular digraph and a pendant vertex in a digraph. Provide examples.

(*h*) Prove that a covering g of a graph is minimal if and only if g contains no path of length three or more.

2. Answer any *two* questions : 5 x 2

(*a*) Define a spanning tree and a circuit in a graph. If S be a cut-set, T be a spanning tree and Γ be a circuit in a graph G, show that $E(S \cap T) \neq \phi$ and $|E(S \cap \Gamma)|$ is an even number, where $E(G)$ represents the edge set of G.

(*b*) Show that a graph has a dual only if it is planar.

(*c*) State and prove five colour theorem.

[*Internal Assessment* — 5 Marks]
