

2017

M.Sc.

1st Semester Examination

**APPLIED MATHEMATICS WITH OCEANOLOGY
AND
COMPUTER PROGRAMMING**

PAPER—MTM-106 (Unit-1)

Subject Code—21

Full Marks : 25

Time : 1 Hour

The figures in the right hand margin indicate full marks.

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

Illustrate the answers wherever necessary.

[Graph Theory]

1. Answer any two questions : 2×2
- (a) Determine which complete bipartite graphs are complete graphs. 2

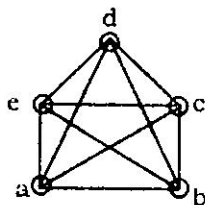
(Turn Over)

(b) Define dual of a planar graph. 2

(c) Show that the number of pendant vertices of a binary tree is one more than the number of internal vertices. 2

2. Answer any *four* questions : 4×4

(a) Consider the following graph :



(i) How many different paths have 'c' as an end vertex ?

(ii) How many different paths avoid vertex 'c' altogether ?

2+2

(b) Prove that for any simple graph G with at least 2 vertices, the degree sequence has at least one pair of repeated entries. 4

- (c) Show that a simple graph with n vertices and any two distinct vertices u and v such that

$$\deg(u) + \deg(v) > n$$

is a connected graph.

4

- (d) Show that a connected graph G is Euler graph iff all vertices of G are of even degree.

4

- (e) State Euler's theorem of Planar graph. Show that a connected simple planar graph all of whose vertices have degree at least 5 must have at least 12 vertices.

1+3

- (f) Define Chromatic number of a graph. Show that

Chromatic polynomial of K_n is $\lambda(\lambda - 1)(\lambda - 2) \cdots (\lambda - \overline{n-1})$.

Hence find Chromatic number of K_5 .

3+1

(Internal Assessment : 5 Marks)
