M.Sc. 1st Semester Examination, 2020

Applied Mathematics With Oceanology And Computer Programming

Paper: MTM – 106 (Unit – 1)

Full Marks: 25 Time : 1 hours

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. $2\times2=4$

(a) Check whether the following sequence represents the degree sequence of a simple graph.
6, 6, 5, 4, 3, 3, 1

(b) Give the example of graphs having

(i) Hamiltonian circuit but not an Eulerian circuit

(ii) Eulerian circuit but not a Hamiltonian circuit

(c) Is it possible to draw a simple graph with 4 vertices and 7 edges?

(d) Explain dual of a planer graph with example.

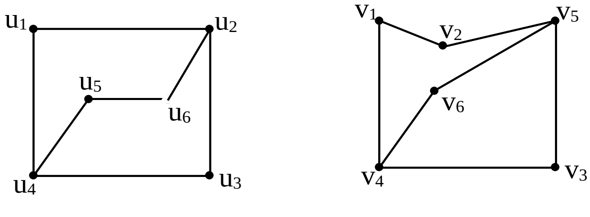
2. Answer any **two** questions: $4\times2=8$

(a) Define Fusion and Contraction of graphs. Explain with examples. Show that in a simple graph of order n (≥ 2) has at least two vertices of same degree.

(b) If a graph has no circuits of odd length prove that it is bipartite.Show that the unit cube Q_3 is bipartite graph.

(c) Define vertex connectivity and edge connectivity of a graph.Give an example of a graph G with the following properties.
$\kappa(G) = 2$, $\lambda(G) = 3$ and $\delta(G) = 4$

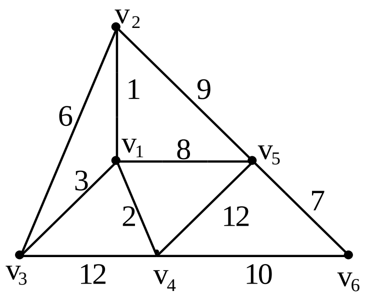
(d) Define isomorphism between two graphs.Determine whether the following graphs are isomorphic or not.



3. Answer **one** question of the following: $8 \times 1 = 8$

(a) Define binary tree. Show that the maximum number of vertices in a binary tree of height n is $2^{n+1} - 1$. Show that chromatic polynomial in a tree with n vertices is $\lambda(\lambda-1)^{n-1}$.

(b) (i) Determine a minimal spanning tree by Prim's algorithm for the graphs shown in the following figure.



(ii) Define perfect matching. Let G be a connected bipartite graph with partite sets V_1 and V_2 and $|V_1| = |V_2| = n \geq 2$. Prove that, if every two vertices of V_1 have distinct degrees in G, then G contains a perfect matching.