LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc.DEGREE EXAMINATION – **MATHEMATICS**

THIRDSEMESTER – NOVEMBER 2017

16PMT3MC04- ALGORITHMIC GRAPH THEORY

Date: 08-11-2017 Dept. No. Max. : 100 Marks
Time: 09:00-12:00

I a) With usual notations show that $\delta \leq \frac{2\epsilon}{\nu} \leq \Delta$.

[OR]

b) Write Fleury's Algorithm . (5)

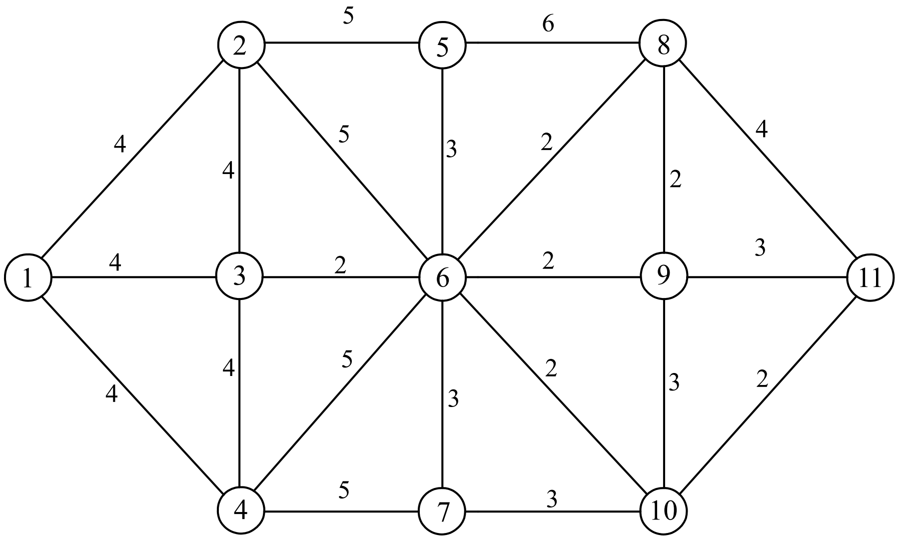
c) i) State and prove Chvatal theorem for Hamiltonian graphs.

ii) Show that a connected graph is a tree if and only if every edge is a cut edge.(10+5)

[OR]

d)i) Prove that a graph is bipartite if and only if it has no odd cycle.

ii)Write Kruskal Algorithm. Apply the same to find MST for the following graph.



(7+8)

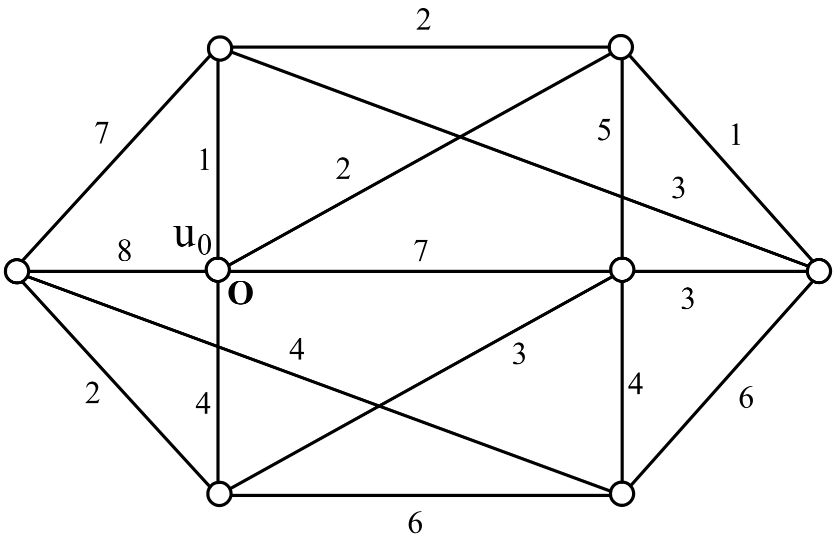
II a) State and prove Euler's formula for planar graphs.

[OR]

b) Show that the sequences $(7, 6, 5, 4, 3, 3, 2)$ and $(6, 6, 5, 4, 3, 3, 1)$ are not graphic.

(5)

c) Write Dijkstra's algorithm. Find shortest path from u_0 to all other vertices using Dijkstra's algorithm for the following graph.



[OR]

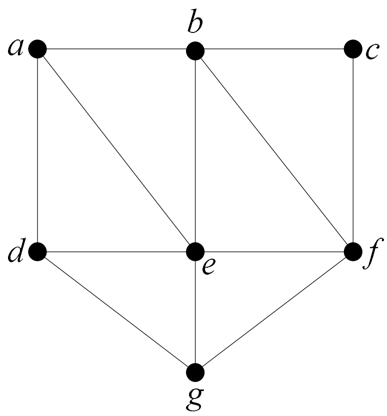
d) Prove that a graph is planar if and only if it has no subdivision of K_5 *or* $K_{3,3}$.(15)

IIIa) Show that C_5 is not a comparability graph.

[OR]

b) Define interval graphs and give an example. (5)

c)State Depth-First search algorithm and simulate it on the following graph by selecting the vertex g.



(15)

[OR]

d) i) State and prove Berg's theorem for maximum matching.

ii) If G is a k regular bipartite graph with $k > 0$, then prove that G has a perfect matching. (10+5)

IVa) Give two families of tree split graphs .

[OR]

b) If G is a split graph then prove that $\overline{G}$ is a split graph. (5)

c)i) State and prove Hammer and Simeone theorem for split graphs.

ii) Write the characterization theorem for split graphs (5+10)

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[OR]

d) i)Write the characterization theorem for permutation graphs.
ii)Show that the complement of a permutation graph is also a permutation graph. (10+5)

Va) Define circular arc graph and give an example .

[OR]

b) Construct permutation graph for the permutation $\pi = (4,3,6,1,5,2)$. (5)

c) i) State and prove Gill and Acharya theorem for permutation graphs.
ii)Write any two applications of a permutation graphs. (8+7)

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[OR]

d) i) State and prove Gilmore and Hoffman theorem for interval graphs.
ii)Show that every interval graph is a circular arc graph. Give an example to show that the converse is not true. (10+5)

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