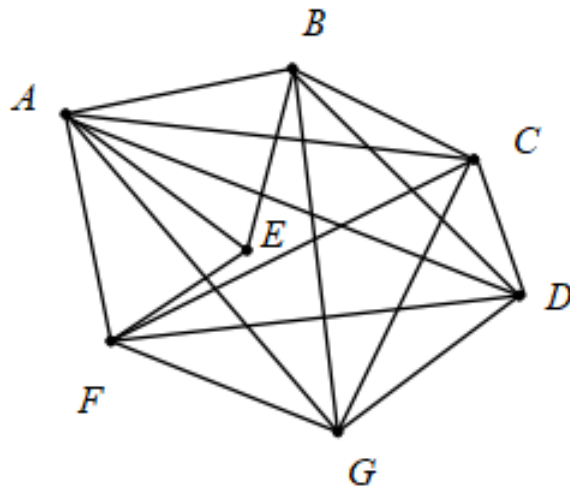


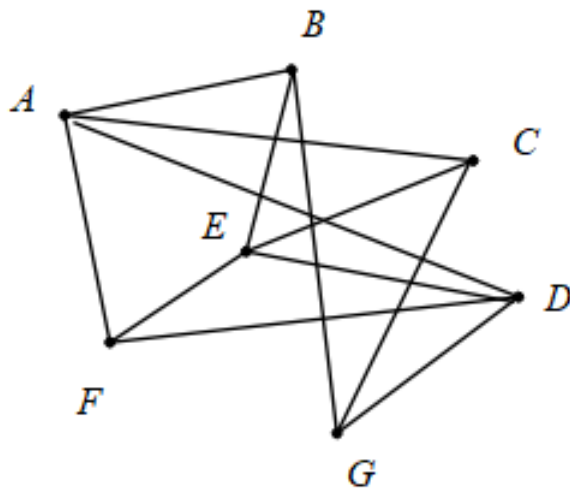
Graphs & Networks - Exercises (Sol'ns) (3 pages; 14/8/19)

(1) Use Kuratowski's theorem to decide whether the following graphs are planar.

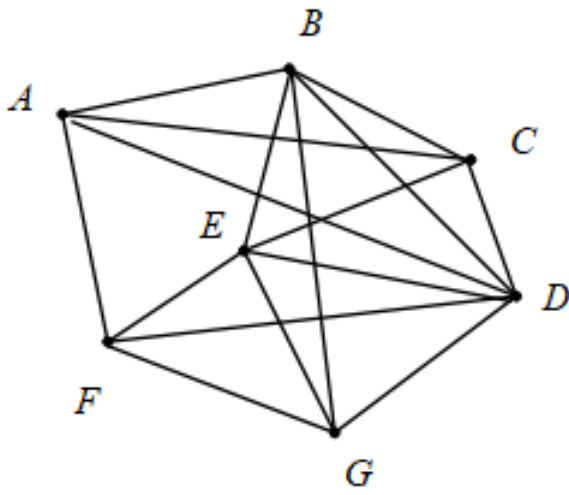
(i)



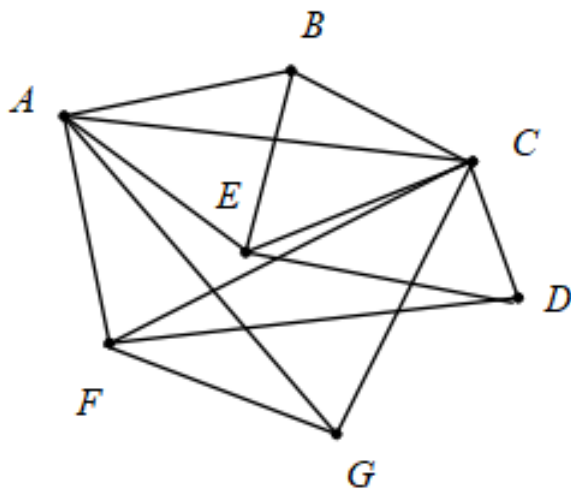
(ii)



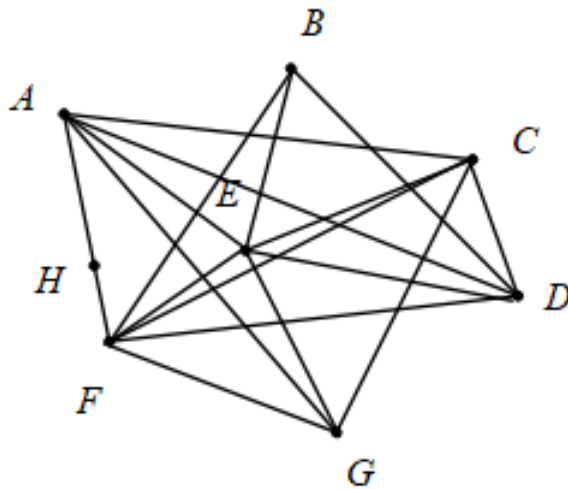
(iii)



(iv)



(v)



Solution

(i) A subgraph of this graph is ACDFG, which is K_5 , and so the graph is non-planar.

(ii) A subgraph of this graph is AEGBCD, which is $K_{3,3}$, and so the graph is non-planar.

(iii) Neither K_5 nor $K_{3,3}$ (or a sub-division of these) is a subgraph of this graph, and so the graph is planar.

(iv) Neither K_5 nor $K_{3,3}$ (or a sub-division of these) is a subgraph of this graph, and so the graph is planar.

(v) A subgraph of this graph is a sub-division of ACDEF, which is K_5 , and so the graph is non-planar.