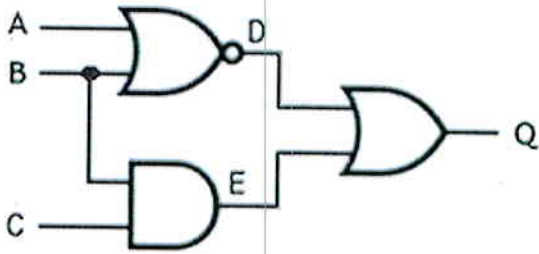
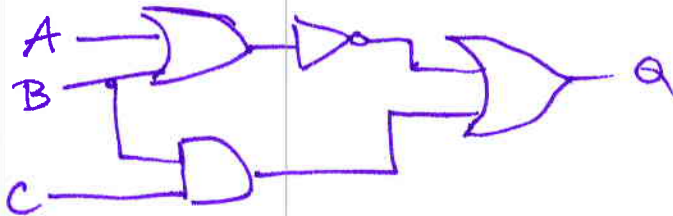


Instructions: Show all work. Justify answers as completely as possible. If you are asked to prove something, mere computation is not enough. You must explain your reasoning. Be sure to state your conclusion clearly. Incomplete work or justification will not receive full credit. Use exact answers unless specifically asked to round.

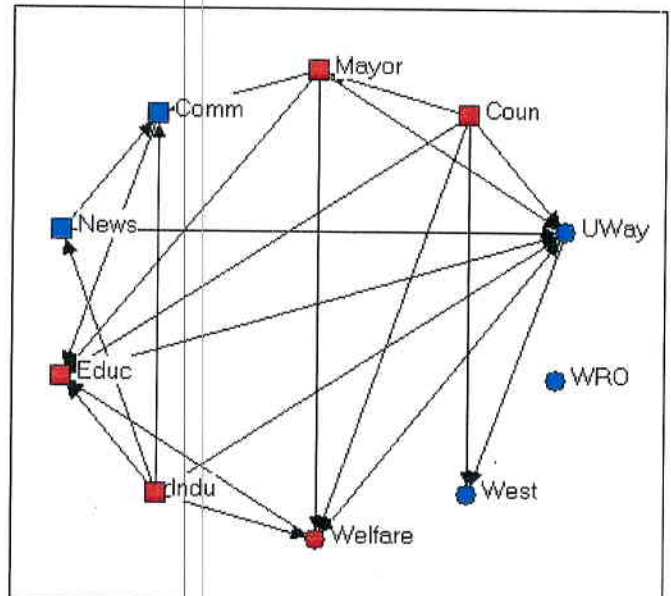
1. Redraw the logic gate shown below so that it uses only products, sums and negation (eliminate any XORs and NANDs). Then write the expression $Q(A, B, C)$ modeled by the circuit using Boolean algebra.



$$\overline{(A+B)} + BC = Q(A, B, C)$$

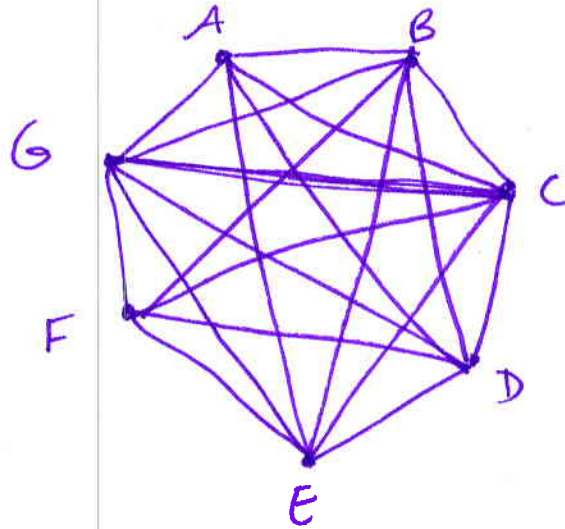


2. For the graph shown below, determine which of the properties it possesses (the terms that can be used to describe it).
- Simple, multigraph, pseudograph
 - Directed, undirected, mixed
 - Which vertices are adjacent to News?
 - Are there any isolated vertices?
 - What is the degree of the Welfare vertex? (if the graph is directed, list both the degree-in and the degree-out)



- a. Simple
 b. directed
 c. Comm, UWay
 d. yes. WRO
 e. degree-in = 3
 degree-out = 2

3. Draw an example of a complete graph with 7 vertices.



4. Find the union of the graphs shown.

