

## Homework #5

### 1 Problem:

The U.S. Army (no surprise, they need our help) has placed a set of wireless sensors in the middle of a hostile environment. They have asked our class to help determine how they should gather and route the flow of data gathered by these sensors. If information is gathered, then it must be relayed to the collection sink for further analysis. Only sensors  $A$ ,  $B$ , and  $C$  are able to gather information, only sensors  $G$ ,  $H$ , and  $I$  are able to send information to collection sink, and all sensors are able to relay information from other sensors according to the table below. Formulate a mathematical programming model for maximizing the total number of GigaBits of information gathered and collected by the sink.

	Maximum GB of Information									
	A	B	C	D	E	F	G	H	I	t
A	0	0	0	6	3	0	0	0	0	0
B	0	0	0	3	0	8	0	0	0	0
C	0	2	0	0	0	6	0	0	0	0
D	0	0	0	0	2	0	9	0	0	0
E	0	0	0	0	0	7	0	11	0	0
F	0	0	0	0	0	0	0	4	9	0
G	0	0	0	0	0	0	0	13	0	9
H	0	0	0	0	0	0	0	0	0	17
I	0	0	0	0	0	0	0	0	0	13

- 1.1 Draw a network diagram depicting the Army's Sensor Network. Clearly label all nodes and arcs as you see appropriate.

- 1.2** Model the Army's problem as a concrete integer programming model. Clearly describe all decision variables, constraints, and the objective.

- 1.3 Model the Army's problem as an abstract integer programming model. Clearly define and describe all sets, parameters, and decision variables.

- 1.4 Solve the Army's problem using a path-augmenting algorithm. State your optimal maximum flow value. Please list each path used and its associated flow value. Draw only the final residual network after running your algorithm