EM384: Analytical Methods for Engineering Management
AT 23-2
Name:
Section :

Homework Set 7

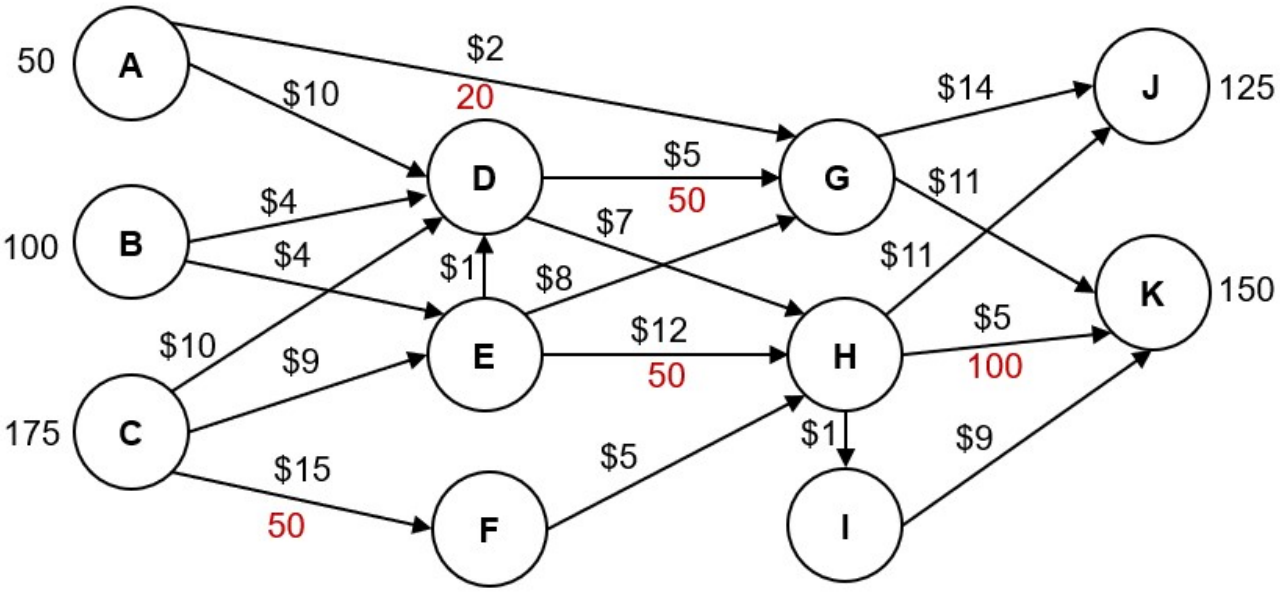
This assignment is worth 20 points, and is due NLT 1700 the day of Lesson 26. Late submissions will be penalized 1 point (5% of the assignment) for each 24-hour period late after the due time - with assignments turned in more than 7 days late receiving 0 points.

- **Documentation**. This deliverable is an individual assignment. Any assistance received must be documented in detail. Document all sources in accordance with the Office of the Dean Pamphlet "Documentation of Academic Work," (June 2015), Appendix E, and course guidance. e-Acknowledge documentation must be turned in through CIS at the time of submission. The deliverable is considered late until all portions of the assignment and the documentation are submitted.
- **Turn-In Requirement**: You will turn in **two files** to microsoft Teams: **One PDF file** (this assignment with your responses filled in the blanks), and **one Excel file** (extension .xlxs) with your model, with the following naming convention:

  Section_LastName_FirstName_EM384_Homework_7

  Remember that engineering management is about communicating. You will be graded on the clarity and structure of your work.
- **Acknowledgement Statement**: This assignment must be accompanied by a signed e-Acknowledgement Statement (DAW) to be eligible for graded credit. If you submit your files(s) but fail to sign the e-Acknowledgement Statement, your assignment will be considered late until the e-Acknowledgement Statement is signed.
- **Guidelines for Documenting Assistance**: For this assignment, individual work is highly encouraged, but collaboration between individuals is allowed. ALL collaboration must be documented. Any discussion of this problem set with anyone other than an EM384 instructor requires documentation. Documentation must be specific and detail the topics discussed and actions taken.
- You must be very specific (which problem, what assistance, etc.) when explaining any assistance used in your documentation or you will be deducted at a higher penalty. Assistance *may* result in a deduction of points in accordance with a holistic assessment by your instructor.
- Sharing of electronic files via email or any other electronic means is strongly discouraged. Using, copying, or being dictated someone else's work will result in a greater point deduction.

1. **Minimum Cost Network Flow Problem**. For this homework set, consider the minimum cost network flow problem depicted by the diagram below.



Each arc has a cost associated with it (above the arc), while only some have capacity constraints (below the arc, in red). The supply / demand is indicated adjactent to their respective nodes.

(a) **(5 Points)** Formulate this problem algebraically using DOC.

(b) **(5 Points)** Model and solve your linear program in an Excel sheet named *transshipment* and report the optimal decision variable values below, in addition to the optimal objective function value.

- Optimal flow from node A to D:
- Optimal flow from node D to G:
- Optimal flow from node H to J:
- Minimum Total Cost for this problem:

(c) **(5 Points)** Now assume that nodes A, B, and C have a fixed cost of \$500 *each*, if they are used in your solution (e.g. Each one that has a flow out greater than 0 incurs a \$500 cost).

Explain how you would modify or add to your formulation from part (a) to model this situation as a site selection problem. In addition to your explanation, you must write down any new or different parts to your original formulation below (you do not need to re-write anything that remains unchanged).

(d) **(5 Points)** Model and solve your new linear program in an Excel sheet named *site selection* and give your answers to the bullet points below (It may be useful to copy your model from (b) to the new sheet to start out).

- Optimal flow from node A to D:
- Optimal flow from node D to G:
- Optimal flow from node H to J:
- Which supply nodes are *not* in use (e.g. have 0 flow out)?
- Minimum Total Cost for this problem: