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| ISyE 8803 |
| Homework 10 |
| Optimization |

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Q1.1, 1.2

Code attached – with inline explanatory comments

Q2.1

1. Yes – it can be solved using a network model
2. No - this cannot be solved with a network model. We cannot enforce ‘proportionality of flow’ in a network model.
3. Yes – this corresponds to the special case of the network model called ‘Maximum Flow’

Q2.2

1. Yes – this can be solved using a network model (Transportation Problem). It is not clear if it is a Balanced Transportation Problem (e.g. supply of worker hours = total worker hours demanded by all tasks)
2. No – the importance *wj* of the task corresponds to a ‘fixed cost of using a node’, which cannot be a constraint in a network model
3. Yes – it is still a network model. The new constraint is the equivalent of a ‘supply constraint’\

Q3

*f*(*x*) = *x*12+ *x*22

Convex, quadratic

*f*(*x*) = (*x*1 − *x*2)3

Not convex; Not quadratic

*f*(*x*) = −*x*12 − *x*24

Not convex; not quadratic

*f*(*x*) = (*x*1 + *x*2)2

convex; quadratic

Q4

In order of easiness – easiest first

* linear program
* network model
* integer program
* convex quadratic program
* convex program
* general (non-convex) nonlinear program