Adama Science and Technology University (ASTU)

School of Applied Natural Science

Department of Applied Mathematics

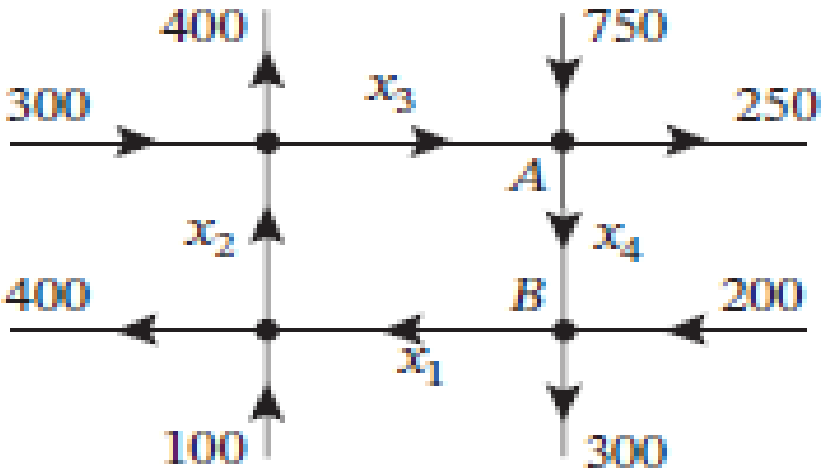
Linear algebra Assignment I (10%)

1. For what values of λ and μ the system: $\begin{aligned} x+y+z &= 6 \\ x+2y+3z &= 10 \\ x+2y+\lambda z &= \mu \end{aligned}$, has

   i. No solution ii. Unique solution iii. Infinitely many solution

2. Let W be the space generated by the polynomials $x^3 + 3x^2 - x + 4$, and $2x^3 + x^2 - 7x - 7$. Find a basis and the dimension of W.

3. The accompanying figure shows a network of one-way streets with traffic flowing in the directions indicated. The flow rates along the streets are measured as the average number of vehicles per hour.
   a. Set up a linear system whose solution provides the unknown flow rates.
   b. Solve the system for the unknown flow rates.
   c. If the flow along the road from A to B must be reduced for construction, what is the minimum flow that is required to keep traffic flowing on all roads?



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Linear Algebra Assignment II (10%)

1. Let $\boldsymbol{A}=\begin{pmatrix} 1 & 0 & -1 \\ 3 & 1 & -5 \\ -4 & 2 & 1 \end{pmatrix}$ and $\boldsymbol{T_A}$ be the linear transformation associated with matrix $\boldsymbol{A}$. Find $\boldsymbol{X}$ such that $T_A(X)=\mathrm{O}$

2. Let $\boldsymbol{A}=\begin{pmatrix} 1 & 3 & 4 & -3 \\ 0 & 1 & 3 & -2 \\ 3 & 7 & 6 & -5 \end{pmatrix}$, $\boldsymbol{b}=\begin{pmatrix} 1 \\ -1 \\ 7 \end{pmatrix}$ and $\boldsymbol{T_A}$ be the linear transformation associated with matrix A.

   i) Find ket $\boldsymbol{T_A}$ ii) Is **b** in the range of $\boldsymbol{T_A}$

   iii) Describe the solution set of $\boldsymbol{AX = b}$

3. Letx_0 be a nonzero column vector in R^2, and suppose that $T\colon R^2 \rightarrow R^2$ is the transformation defined by the formula $T(x)=x_0+R_\theta x$,where R_θ is the standard matrix of the rotation of R^2, about the origin through the angleθ.Give geometric description of this transformation. Is it a matrix transformation? Explain.