Au19_ EnggMaths | Assignment #2 – Lec 2 and Lec 3

Topics – Gauss Elimination, LU decomposition and Vector spaces

Q1 – Given a first reference plane $u + 2v - w = 6$ find equation for

a) parallel plane through origin
b) second plane that contains (6,0,0) and (2,2,0) apart from origin
c) third plane that is perpendicular to second and passes through (4,1,0) and origin

Q2 – Solve

$$u + v + w = 0$$
$$u + 2v + 3w = 0$$
$$3u + 5v + 7w = 1$$

Q3 – For which values of K does the following has

a) no solution
b) one solution
c) infinitely many solutions

$$kx + y = 1$$
$$x + ky = 1$$

Q4 – For following equations

$$u + v + w = 2$$
$$u + 3v + 3w = 0$$
$$u + 3v + 5w = 2$$

a) for matrix representation (**A**x=b)
b) calculate determinant of |A|
c) reduce it to upper triangular matrix
d) which are pivot values? what is the product of all those pivot values?
e) replace last equation by $2u + 3v + 3w = 3$ and repeat above steps.

Q5 – Use Gauss-Jordan method to find inverse of following:

$$\begin{bmatrix} 1 & 0 & 0 \\ p & 1 & 0 \\ q & 0 & 1 \end{bmatrix}$$

Q6 – Prove following corollaries for vector space derived from basic requirements for the defined addition and scalar multiplication operations for:

a) $0\boldsymbol{u} = 0$ (hint: 0 = 0 + 0)
b) $\alpha\mathbf{0} = 0$ (hint: **0** = **0 + 0**)
c) Vector space should always have **0**

Q7 - Is a set of all [3x4] matrices under the normal laws of addition and scalar multiplication a vector space?

Q8 – Is positive quadrant of a XY plane (x>=0 and y >= 0) a vector space?

Q9 – Using your *own* experience find a simple problem in daily life that can be framed as Ax=b?