**IT441 – QUIZ #2**

SOLUTIONS

Q-1. A cuboid of width 4M, height 3M and depth 2M is situated with its centre at the origin of the 3D coordinate system, and edges parallel to X, Y, Z axes. See Figure 1. Find the volume of the portion of the cuboid defined by:

x > 0, y > 0, z > 0.

SOLUTION: Centre of cuboid as at the origin of the XYZ coordinate system. Therefore the volume corresponding to [ x > 0, y > 0, z > 0 ] equals 1/8 of the total cuboid volume 🡪 answer = 3M3.

Q-2. In the 3D space defined by X, Y, Z axes, the linear equation:

x + M\*y + z = M

defines a plane. Find the unit vector normal to this plane.

SOLUTION: Select any three non-colinear points on the plane, say P0, P1 and P2. One way: Choose x = y = 0 for P0; solve for z. Choose x = z = 0 for P1; solve for y. Choose y = z = 0 for P2; solve for x. Let **V** = cross-product of vectors **P0P1** and **P0P2**. Answer = **V** / |**V**|.

Q-3. You are given a polyhedron which is a truncated pyramid, whose base is a 3\*M sided polygon. Find the number of edges in this polyhedron.

SOLUTION: M edges on one face, M edges on the other face, and M edges between the two faces. So total = 3 x 3M = 9M edges.

Q-4. Figure 3 gives the 4x4 matrix MH which defines the Hermite family of cubic curves in parametric form, with 0 < t < 1. In a given instance, the x-component Gx of the geometry vector is given by [ 0 M 2 2 ]T. Find x(0.5).

SOLUTION: Post-multiply MH by GX = [ 0 M 2 2 ]T. Pre-multiply resulting column vector by [ t3 t2 t 1 ]. Finally substitute t = 0.5. Answer = M/2.

