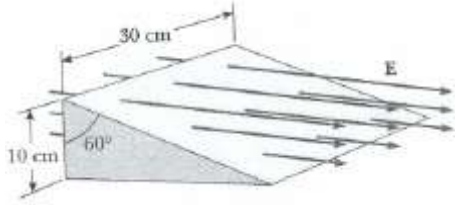
Q- Consider a closed triangular box resting within a horizontal electric field of magnitude E =7.80 X 10^4 N/C as shown in Figure. Calculate the electric flux through (a) the vertical rectangular surface, (b) the slanted surface, and (c) the entire surface of the box.



The electric flux through a surface is given by

$$\phi_E = \int \vec{E} \bullet d\vec{s} = \int E * ds * \cos\theta = E * s * \cos\theta$$

Here E is the field strength, s is the surface and θ is the angle between the field and normal to the surface.

(a) As the vertical rectangular surface is normal to the field θ = 0 and cos θ =1 and hence ϕ = E*s = 7.80*10^4*(0.10 m x 0.30 m) = 2340 Nm^2/C.

As this flux is going in to the box it should be taken negative, hence the flux through the vertical rectangular surface is - **2340 Nm^2/C.**

(b) As the slant surface is having the same vertical height and the width, the flux crossing it is same as the vertical rectangular surface. Or we can say that projection of the area vector for the slant surface normal to the field is equal to the area vector of the vertical rectangular surface hence the flux through it is same as that of the vertical surface but as it coming out of the box, taken positive and hence equal to **2340 Nm^2/C.**

(c) The entire surface of the box is a closed surface and as there is no charge within it, hence according to Gauss law the flux through the entire closed surface is zero.

Actually for a closed surface the flux into the closed surface is taken as negative and flux out of the surface is taken as positive. As the flux out of the slant surface (positive) is equal in the magnitude of that into the vertical surface (negative) hence total flux out of the closed surface is considered **zero**.