Q- An automobile has a vertical radio antenna 1.20 m long. The automobile travels at 72.0 km/h on a horizontal road where the Earth's magnetic field is 50.0 μT directed toward the north and downward at an angle of 60.0° below the horizontal. Calculate the maximum possible magnitude of EMF induced in the antenna.

72km/hr = 72*5/18 = 20 m/s

As the antenna is vertical, vertical component of the magnetic field is not effective. The effective component is the horizontal component of earth's magnetic field and is given by

H = B cos θ = 50.0*10^{-6}*cos60 =2.5*10^{-5} T

Now as the horizontal component is towards north, the antenna will cross maximum flux when it is moving right angle to it i.e. either towards east or west. Thus the maximum motional induced EMF in the wire is given by

e = B*L*v*sin 90^0 = 2.5*10^{-5}*1.2*20 = 6.0*10^{-4} v