Answer on Question #43499, Engineering, Other

Expand the following Boolean functions into their canonical form:

    i.   f(X,Y,Z)=XY+YZ+ X Z+ X Y
    ii.   f(X,Y,Z)=XY+ X Y + X YZ

Solution.

x	y	z	Minterms	Notation
0	0	0	$x'\,y'\,z'$	m_0
0	0	1	$x'\,y'\,z$	m_1
0	1	0	$x'\,y\,z'$	m_2
0	1	1	$x'\,y\,z$	m_3
1	0	0	$x\,y'\,z'$	m_4
1	0	1	$x\,y'\,z$	m_5
1	1	0	$x\,y\,z'$	m_6
1	1	1	$x\,y\,z$	m_7

$$XY + YZ + X'Z + X'Y$$
$$= XY(Z + Z') + (X + X')YZ + X'(Y + Y')Z + X'Y(Z + Z')$$
$$= XYZ + XYZ' + XYZ + X'YZ + X'YZ + X'Y'Z + X'YZ$$
$$+ X'YZ' = XYZ + XYZ' + X'YZ + X'Y'Z + X'YZ'$$
$$= m_1 + m_2 + m_3 + m_6 + m_7$$

Answer: $XY + YZ + X'Z + X'Y = m_1 + m_2 + m_3 + m_6 + m_7$

$$XY + X'Y + X'YZ = XY(Z + Z') + X'Y(Z + Z') + X'YZ$$
$$= XYZ + XYZ' + X'YZ + X'YZ' + X'YZ$$
$$= XYZ + XYZ' + X'YZ + X'YZ' = m_2 + m_3 + m_6 + m_7$$

Answer: $XY + X'Y + X'YZ = m_2 + m_3 + m_6 + m_7$