1. (25 pts) Let $F(X_1, X_2, X_3, X_4) = (X_1 + X_2)\ \overline{X_3} + X_1\ X_2\ X_4 + \overline{X_1}\ \overline{X_3}$

(i) Fill the Karnaugh map for F given below. (7pts)

KMAP for F

X_3X_4 \ X_1X_2	00	01	11	10
00				
01				
11				
10				

(ii) Find the Boolean expression for the minimum sum of products form of F using the method of Karnaugh map (**your answer to part i must be correct to get credit from this part**). (10pts)

(iii) Implement F using minimum number of NAND gates (any input size is allowed). Complements of the variables and logic levels 0 and 1 are **not** available (you need to produce them). (8pts)

4. (25 pts)

(i) Convert 16.15_8 to binary. (5pts)
(ii) Convert 10111.001101_2 to hexadecimal. (5pts)
(iii) Convert 112.5_{10} to binary (5pts)