COMPUTER SCIENCE TRIPOS Part IA – 2015 – Paper 2

1 Digital Electronics (IJW)

(*a*) Write down simplified sum of products (SOP) and product of sums (POS) expressions for the following Boolean functions:

(*i*) $X = A \oplus B \oplus C$ [3 marks]

(*ii*) $Y = (A + \overline{B} + \overline{C}).(\overline{A} + \overline{D}).(A + C)$ [3 marks]

(*b*) Using a four variable Karnaugh map, fill it with 1s and 0s to find a function that illustrates each of the following situations. Write down the number of terms and the number of literals for each situation.

(*i*) The minimised SOP and POS forms have the same number of terms and literals. [3 marks]

(*ii*) The minimised POS form has fewer terms and literals than the minimised SOP form. [3 marks]

(*c*) For the following Boolean function,

$F = \overline{A}.\overline{B}.\overline{C} + A.\overline{C}.\overline{D} + \overline{A}.C.D + B.C.\overline{D} + \overline{B}.C.D$

show how it may be implemented using:

(*i*) one 16:1 multiplexor

(*ii*) one 8:1 multiplexor and one or more NOT gates

[8 marks]