

COMPUTER SCIENCE TRIPOS Part IA – 2018 – Paper 2

1 Digital Electronics (IJW)

- (a) Use Boolean algebra to minimise the following expressions. Give your answers in sum-of-products form.

$$(i) \quad W = (X + Y).(\overline{X} + Z)$$

$$(ii) \quad F = (A + B + \overline{C}).(A + B + D).(A + B + E).(A + \overline{D} + E).(\overline{A} + C)$$

[8 marks]

- (b) There may be more than one way of minimising a given Boolean expression into sum-of-products form. Demonstrate this by drawing a four-variable Karnaugh map that has two different minimised forms for the same Boolean expression, each with the same number of terms and literals. [4 marks]

- (c) Simplify the following function $f(A, B, C, D, E)$ specified using the decimal representation of its minterms (where A represents the most significant bit of the equivalent binary representation) using the Quine-McCluskey (Q-M) method:

$$f(A, B, C, D, E) = \sum(0, 2, 3, 5, 7, 9, 11, 13, 14, 16, 18, 24, 26, 28, 30)$$

[8 marks]