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This assignment is due on 12 June 2022

Please remember to write your name and student number.

You must complete the following assignment and submit a PDF of relevant questions. Handwritten submissions and proprietary formats (e.g. Pages or MS Word) will not be accepted. You will also need to upload LogicWork circuit design file. Then upload a single ZIP file to Moodle.

Submission File structure:

```

submission.zip
  - answer.pdf
  - circuit2a.cct
  - circuit2b.cct
  - circuit4a.cct
  - circuit4b.cct

```

The circuit files are 2.5pt each, while the PDF portion is 10pt in total.

Lab 1

- Work on the following boolean equations (2.5pt).
 - Using algebraic manipulation to prove: $A(\bar{A} + B)(\bar{A}\bar{B} + C)(\bar{A}\bar{B}\bar{C} + D) = ABCD$
 - Transform to only using NOT and OR: $\bar{A}\bar{B}\bar{C} + CD$
 - Simplify using algebraic manipulation: $\bar{X}\bar{Y} + XYZ + \bar{X}Y$
 - Simplify using algebraic manipulation: $\overline{A + B + C} \cdot \bar{A}\bar{B}\bar{C}$
- Optimise the following boolean functions using a K-map (2.5pt), then implement the circuit in logic works as `circuit2a.cct` and `circuit2b.cct`. You must **clearly label your input** according to the variables here, and you must clearly label your output prob as F .
 - $F(A, B, C, D) = \sum m(2,3,8,9,10,12,13,14)$
 - $F(A, B, C, D) = \sum m(1,3,6,7,9,11,12,13,15)$
- Optimise the following boolean expressions in Product-of-Sums form. (2.5pt)
 - $F(A, B, C, D) = \sum m(0,2,3,4,8,10,11,15)$
 - $F(W, X, Y, Z) = \prod M(0,2,4,5,8,10,11,12,13,14)$
- The denotation of don't care condition is $d(A, B, C, D) = \sum m(\dots)$ complimenting the boolean function F . Optimise the following Boolean function F together with the don't care condition d . (2.5pt) Implement the two boolean expressions in LogicWorks, save as `circuit4a.cct` and `circuit4b.cct`. You must **clearly label your input** according to the variables here, and you must clearly label your output prob as F .
 - $F(A, B, C, D) = \sum m(0,1,7,13,15)$, $d(A, B, C, D) = \sum m(2,4,6,8,9,10)$
 - $F(A, B, C) = \sum m(1,2,4)$, $d(A, B, C) = \sum m(0,3,6,7)$

