



Homework 3- due September 18<sup>th</sup> at < 6 P.M.

**1) Karnaugh Maps (27)**

Simplify the following functions in POS form:

- a)  $X_{A,B,C,D} = \sum (1,4,5,6,12,13,14)$
- b)  $S_{K,M,N,F} = \prod (3,7,11,15)$

Simplify in POS and SOP forms:

- c)  $J_{U,N,V,T} = \sum (0,1,4,9) + d(2,3,5,6,7,13)$

**2) Number System Conversions (28 pts)**

|     | Convert        | to base | and to base |
|-----|----------------|---------|-------------|
| (a) | $451_{10}$     | 2       | 16          |
| (b) | $-90_{10}$     | 3       | 16          |
| (c) | $234_{10}$     | 7       | 6           |
| (d) | $-1F.29_{16}$  | 8       | 6           |
| (e) | $A4C_{16}$     | 10      | 2           |
| (f) | $101101001_2$  | 16      | 10          |
| (g) | $765.240_{10}$ | 2       | 16          |

**3) Base 'n' Arithmetic (35 pts)**

Given the following numbers, compute the results of:

- a + b
- a - b
- a \* b

Without converting them to decimal form:  
 (Use the same base to express the result)

|             | a            | b           |
|-------------|--------------|-------------|
| (A) base 2  | $10010_2$    | $10011_2$   |
| (B) base 8  | $-251_8$     | $63_8$      |
| (C) base 16 | $A2F_{16}$   | $1C3_{16}$  |
| (D) base 2  | $0111101_2$  | $-101_2$    |
| (E) base 2  | $1011.011_2$ | $111.101_2$ |

**4) Complete with the law or property used in the derivation (10 pts):**

Here we demonstrate the consensus law:

$$xy + \bar{x}z + yz = xy + \bar{x}z \quad \underline{\text{Consensus Law}}$$

(A)  $xy + \bar{x}z + (1)yz$  \_\_\_\_\_

(B)  $= xy + \bar{x}z + (x + \bar{x})yz$  \_\_\_\_\_

(C)  $xy + \bar{x}z + xyz + \bar{x}yz$  \_\_\_\_\_

(D)  $(xy + xyz) + (\bar{x}z + \bar{x}zy)$   
 $xy + \bar{x}z$  \_\_\_\_\_

Another example:

Let's simplify:

$$(\bar{x} + y)wz + \bar{x}y\bar{v} + vwz$$

Assuming:

$$\bar{x}y = a \quad \text{and} \quad wz = b$$

(Note:  $\bar{a} = \bar{\bar{x}} + y$ )

Then  $(\bar{x} + y)wz + \bar{x}y\bar{v} + vwz$

$$= \bar{a}b + av + vb$$

$$= av + \bar{a}b + vb$$

(E) \_\_\_\_\_

$$= av + \bar{a}b$$

$$x\bar{y}\bar{v} + (\bar{x} + y)wz$$