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Problem Sheet #06

Problem 6.1:

a- Conversion of each byte into binary:

0xc2 = 0b11000010
0xac = 0b10101100
0xf0 = 0b11110000
0x9f = 0b10011111
0x92 = 0b10010010
0xbb = 0b10111011
0xe2 = 0b11100010

0x86 = 0b10000110
0xa6 = 0b10100110
0xf0 = 0b11110000
0x9f = 0b10011111
0x97 = 0b10010111
0x91 = 0b10010001

b-) Unicode code points of the characters:

* 0xc2ac = 0b11000010 10101100 = U+00AC = '¬'
* 0xF09F92BB = 0b11110000 10011111 10010010 10111011
  = U+1F4BB ⇒ Laptop émoji
* 0xe286a6 = 0b11100010 10000110 10100110
  = U+21A6 ⇒ North west arrow émoji

* 0xF09F9791 = 0b11110000 10011111 10010111 10010001
= U+1F691 ⟹ "Ambulance émoji"

⟹ All characters aren't in the ASCII range, they are encoded using more than one byte.
Hence, we remove the leading format bits, and then align them into 8-bit blocks which will give us the resulted stored text in the file.

Problem 6.2:

a-) From the three rules mentioned above, we can deduct the following formula:

$$D(B,F,I) = (B \vee F) \wedge (\neg(B \wedge F) \vee \neg I) \wedge (\neg(I \vee \neg B) \vee \neg F)$$

b-) Now, let's construct the truth table:

(Next Page)

B	F	I	$\neg B \to F$	$B \wedge F$	$(B \wedge F) \Rightarrow \neg I$	$I \vee \neg B$	$(I \vee \neg B) \Rightarrow \neg F$	$D(B,F,I)$
0	0	0	0	0	1	1	1	0
0	0	1	0	0	1	1	1	0
0	1	0	1	0	1	1	0	0
0	1	1	1	0	1	1	0	0
1	0	0	1	0	1	0	1	1
1	0	1	1	0	1	1	1	1
1	1	0	1	1	1	0	1	1
1	1	1	1	1	0	1	0	0

c-) From the previous truth table we can derive the following formula:

$$D(B,F,I) = (B \wedge \neg F \wedge \neg I) \vee (B \wedge \neg F \wedge I) \vee (B \wedge F \wedge \neg I)$$

DNF

$$= B \wedge \neg(I \wedge F)$$

$$= (B \wedge \neg I) \vee (B \wedge \neg F)$$