Q3 Let x_i be the XNOR (check whether two bits are same)

$A_3 A_2 A_1 A_0$ — A

$B_3 B_2 B_1 B_0$ — B

$A = B \Rightarrow x_i = A_3 B_3 + A_3' B_3' = 1 \ \forall \ i$

$\therefore \boxed{x_3 x_2 x_1 x_0 = 1}$ → condition for $A = B$

(2 marks).

$A > B$

(i) A is +ve AND B is -ve $\Rightarrow A > B$.

Boolean exp for this cond^n = $A_3' B_3$

(ii) A is +ve AND B is +ve

Boolean exp = $A_3' B_3' (A_2 B_2' + x_2 A_1 B_1' + x_2 x_1 A_0 B_0')$

$A_3' B_3'$ ↓ cond^n for A & B both +ve

$(A_2 B_2' + x_2 A_1 B_1' + x_2 x_1 A_0 B_0')$ ↓ exp. for 3 bit unsigned comp

(iii) A is -ve AND B is -ve

Boolean exp = $A_3 B_3 (A_2 B_2' + x_2 A_1 B_1' + x_2 x_1 A_0 B_0')$

Key to note that expression within brackets does not change. (2M)

$A > B = (i) + (ii) + (iii)$

$= A_3' B_3 + x_3 A_2 B_2' +$ [illegible]

$+ x_3 x_2 A_1 B_1' + x_3 x_2 x_1 A_0 B_0'$

(2M)

$A < B$

Similar analysis & final expression

(2M)

Circuit = 3 M