

# GATE:CS22-18

Anantha Krishnan

## I. QUESTION

Let R1 and R2 be two 4-bit registers that store numbers in 2's complement form. For the operation R1 and R2, which one of the following values of R1 and R2 gives an arithmetic overflow?

- (A) R1 = 1011 and R2 = 1110
- (B) R1 = 1100 and R2 = 1010
- (C) R1 = 0011 and R2 = 0100
- (D) R1 = 1001 and R2 = 1111

## II. SOLUTION

Converting each 2's complement to their binary equivalent, Adding up and converting to 2's complement form:

(A)

$$R1 = -(0101) \text{ and } R2 = -(0010) \quad (1)$$

$$R1 + R2 = 1001 \quad (2)$$

(B)

$$R1 = -(0100) \text{ and } R2 = -(0110) \quad (3)$$

$$R1 + R2 = 0110 \quad (4)$$

(C)

$$R1 = +(0011) \text{ and } R2 = +(0100) \quad (5)$$

$$R1 + R2 = 0111 \quad (6)$$

(D)

$$R1 = -(0111) \text{ and } R2 = -(0001) \quad (7)$$

$$R1 + R2 = 1000 \quad (8)$$

In option (B) the signed bit of the sum changed from each of the both same signed numbers indicating an overflow. Code for implementation through platformio [write link here](#)