

**ASSIGNMENT 1 : QUESTION 11**  
**(A)**

ABHAY SHANKAR K : CS21BTECH11001

Given:

- $f(x) = x^3 + (kx + 8)x + k$
- Sum of remainders of  $f(x)$  after dividing by  $(x + 1)$  and  $(x - 2)$  is 1

Find:

- Remainders of  $f(x)$  after dividing by  $(x + 1)$  and  $(x - 2)$
- The value of  $k$

**Solution :**

By the remainder theorem,  
The remainder after dividing a polynomial  $p(x)$  by  $(x - r)$  is equal to  $p(r)$ .

Therefore,

$$\begin{aligned}f(x) \mod (x + 1) &= f(-1) \\f(x) \mod (x - 2) &= f(2)\end{aligned}$$

$$\begin{aligned}f(-1) &= (-1)^3 + (k(-1) + 8) * (-1) + k \\&= -1 + k - 8 + k \\&= \underline{2k - 9}\end{aligned}$$

$$\begin{aligned}f(2) &= 2^3 + (2k + 8) \cdot 2 + k \\&= 8 + 4k + 16 + k \\&= \underline{5k + 24}\end{aligned}$$

Given that  $(2k - 9) + (5k + 24) = 1$   
Rearranging, we get  $7k = -14$

Therefore  $k = -2$

Substituting the value of  $k$ , we get

$$2k - 9 = -13$$

$$5k + 24 = 14$$

Therefore, the remainders are :

$$f(x) \mod (x + 1) = -13$$

$$f(x) \mod (x - 2) = 14$$