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,

$f(x) \mod (x + 1) = f(-1)$
$f(x) \mod (x - 2) = f(2)$

$f(-1) = (-1)^3 + (k(-1) + 8) * (-1) + k$
$i.e. \quad = -1 + k - 8 + k$
$i.e. \quad = \underline{2k - 9}$

$f(2) = 2^3 + (2k + 8) * 2 + k$
$i.e. \quad = 8 + 4k + 16 + k$
$i.e. \quad = \underline{5k + 24}$

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

Therefore $\underline{k = -2}$

Substituting the value of k, we get
$2k - 9 = -13$
$5k + 24 = 14$

Therefore, the remainders are :
$f(x) \mod (x + 1) = -13$
$f(x) \mod (x - 2) = 14$