

Answer on Question #52418, Engineering, Other

When a direct current of 2 A is passed through a coil, the potential difference across the coil is 20 V. When an alternating current of 2 A at frequency 40 Hz is passed through a coil, the potential difference across the coil is 140 V. Find the current in the coil if it is connected to a 230 V, 50 Hz supply.

Solution:

From direct current we can obtain resistance:

$$R = \frac{V}{I} = \frac{20}{2} = 10 \Omega$$

Inductive reactance

$$X_L = 2\pi fL$$

Impedance

$$Z = \sqrt{R^2 + X_L^2}$$

Current

$$I_1 = \frac{V_1}{Z_1}$$

Thus, from given

$$Z_1 = \frac{V_1}{I_1} = \frac{140}{2} = 70 \Omega$$

Hence,

$$X_L = \sqrt{Z_1^2 - R^2} = \sqrt{70^2 - 10^2} = 40\sqrt{3} \Omega$$

The Inductance

$$L = \frac{X_L}{2\pi f_1} = \frac{40 * \sqrt{3}}{2 * \pi * 40} = \frac{\sqrt{3}}{2\pi}$$

Thus, for 230 V, 50 Hz supply we have

$$I = \frac{V_2}{Z_2} = \frac{V_2}{\sqrt{R^2 + (2\pi f_2 L)^2}} = \frac{230}{\sqrt{10^2 + \left(2 * \pi * 50 * \frac{\sqrt{3}}{2 * \pi}\right)^2}} = \frac{230}{\sqrt{10^2 + (50 * \sqrt{3})^2}} = 2.64 \text{ A}$$

Answer: 2.64 A

```
#include <iostream>
#include <cstdlib>
using namespace std;
int main() {
    int number;
    cout << "Enter the number from 1 to 10 : ";
    cin >> number;
    if (cin.fail() || number < 1 || number > 10) {
        cout << "wrong input\n";
        system("pause");
    }
}
```