

Transmisja Danych – Lab 04

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Kod źródłowy:

```
// Krystian Bartosik
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// FEDCBA
#define _USE_MATH_DEFINES
#include <iostream>
#include <fstream>
#include "math.h"
#include <complex>

using namespace std;

complex<double>* DFT(double* Tab, int n)
{
    complex<double>* c = new complex<double>[n];
    complex<double> i = 0.0 + 1.0i;
    for (int k = 0; k < n; k++)
    {
        c[k] = 0.0 + 0.0i;

        for (int j = 0; j < n; j++)
        {
            c[k] = c[k] + (Tab[j] * exp(-2 * M_PI * i * (double)k * (double)j / double(n)));
        }
    }
    return c;
}

double TonProsty(double A, double f, double t)
{
    return A * sin(2 * M_PI * f * t);
}

double ModulacjaAmplitudy(double kA, double f, double t)
{
    return (kA * TonProsty(1.0, 6, t) + 1) * cos(2 * M_PI * 10 * f * t);
}

double ModulacjaFazy(double kP, double f, double t)
{
    return cos(2 * M_PI * 10 * f * t + kP * TonProsty(1.0, 6, t));
}

int main()
{
    fstream File;
    File.open("C:/Users/Qrystian/Desktop/results.txt", ios::out);

    double* Tab;
    double* M;
    complex<double>* X;

    double kA, kP;
```

```

int size = (unsigned int)(1.0 / 0.001);
    Tab = new double[size];
    M = new double[size];

    //kA = 0.5; kP = 1.5;
    //kA = 5; kP = M_PI/2;
    kA = 70; kP = 70;

    for (double t = 0.0; t < 1; t = t + 0.0001)
    {
        //File << t << " " << TonProsty(1.0, 6.0, t) << endl;
        //File << t << " " << ModulacjaAmplitudy(kA, 6.0, t) << endl;
        //File << t << " " << ModulacjaFazy(kP, 6.0, t) << endl;
    }

    //      -      -      ZADANIE 2      -      -      //

    int j = 0;
    for (double t = 0.0; t <= 1; t = t + 0.001)
    {
        //Tab[j] = ModulacjaAmplitudy(kA, 6.0, t);
        Tab[j] = ModulacjaFazy(kP, 6.0, t);
        j++;
    }
    size = (unsigned int)(1.0 / 0.001);
    X = DFT(Tab, size);

    for (j = 0; j < size; j++)
    {
        M[j] = sqrt(pow(X[j].real(), 2) + pow(X[j].imag(), 2));
        M[j] = 10 * log10(M[j]);
    }

    j = 0;
    for (double t = 0.0; t <= 1; t = t + 0.001)
    {
        File << j * (0.001 /size) << " " << M[j] << endl;
        j++;
    }

    File.close();

    // Szerokość Za(t), kA=0.5 -> W = 0.06
    // Szerokość Zp(t), kA=1.5 -> W = 0.00004
    // Szerokość Za(t), kA=5 -> W = 0.0005
    // Szerokość Zp(t), kA=PI/2 -> W = 0.000058
    // Szerokość Za(t), kA=70 -> W = 0.0006
    // Szerokość Zp(t), kA=70 -> W= 0.0000116
}

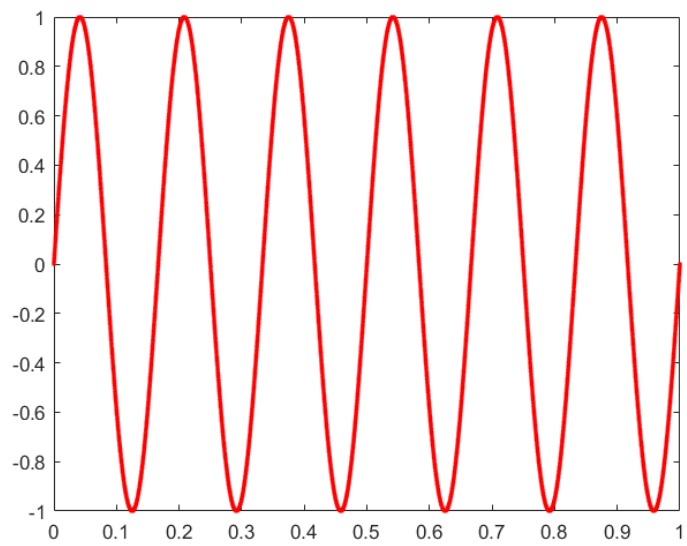
```

Opis kodu:

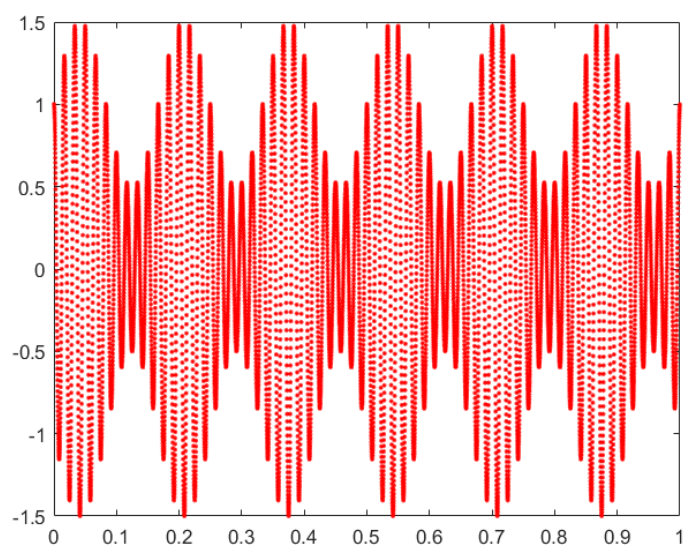
- Zadanie 1
- Zadanie 2

Do obliczenia szerokości konkretnych pasm, została wyznaczona wartość fmax i fmin. W komentarzu jest wynik różnicy.

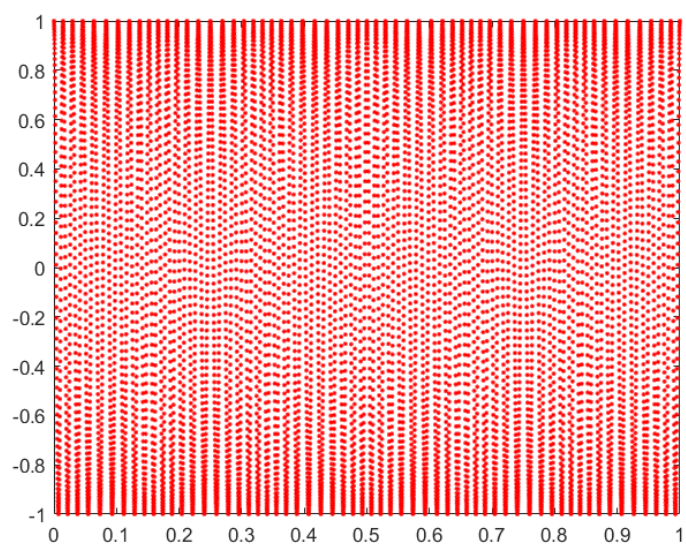
Wygenerowane wykresy:



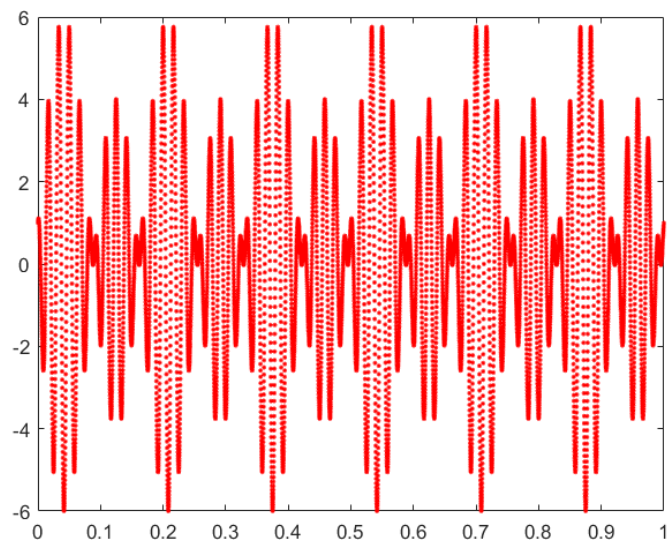
Wykres 1
Ton prosty



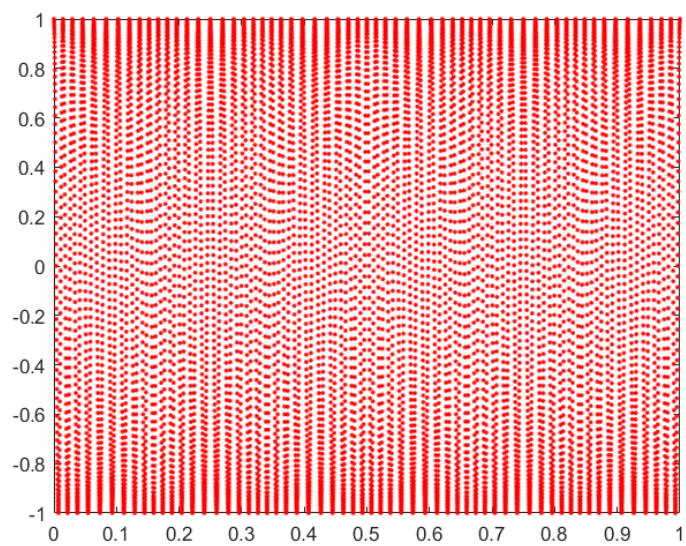
Wykres 2
a) $kA=0.5$



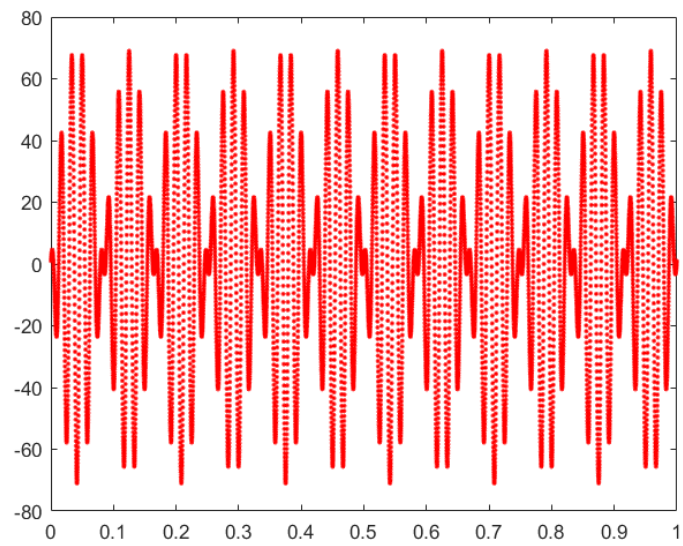
Wykres 3
a) $kP=1.5$



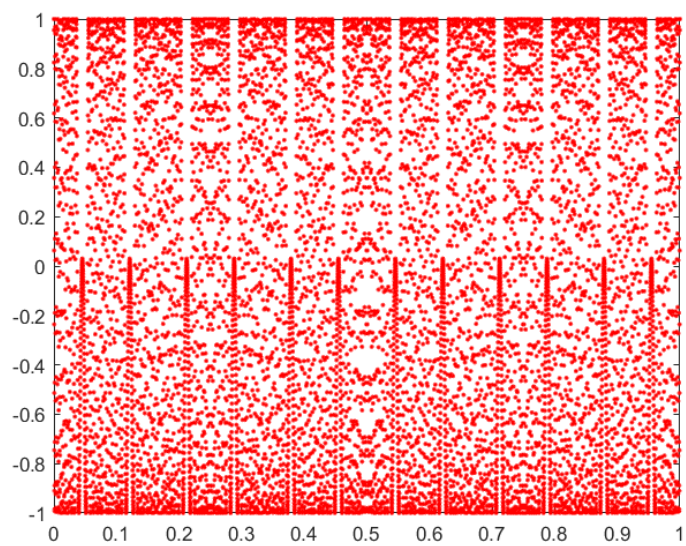
Wykres 4 b)
 $kA=5$



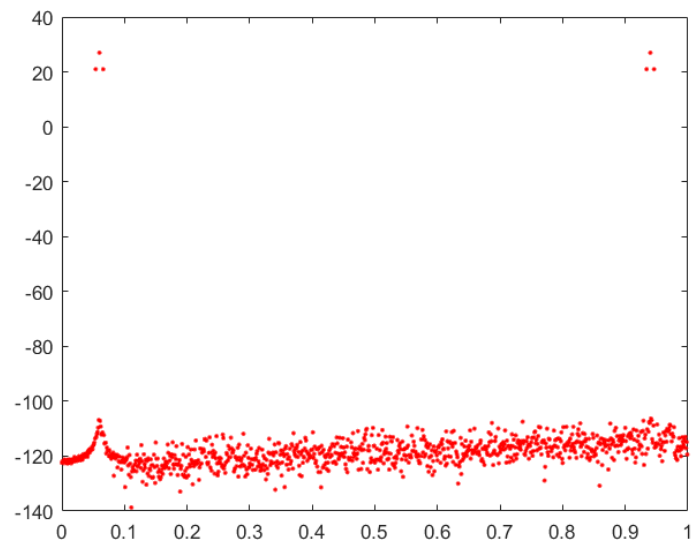
Wykres 5 b)
 $kP=\pi/2$



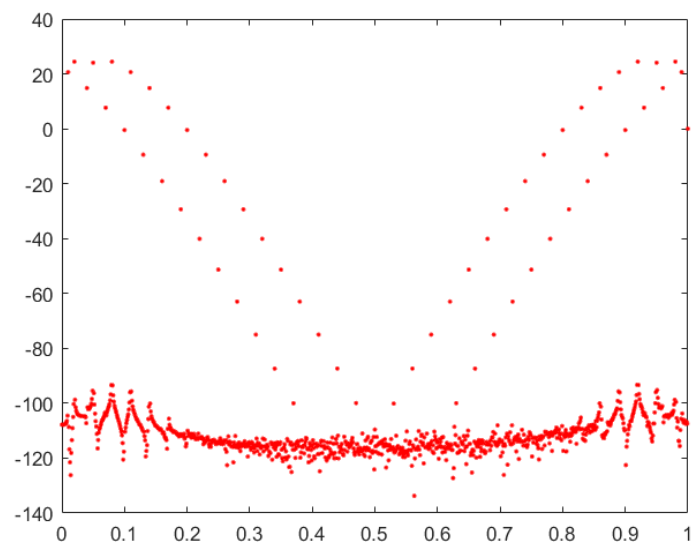
Wykres 6
c) $kA=70$



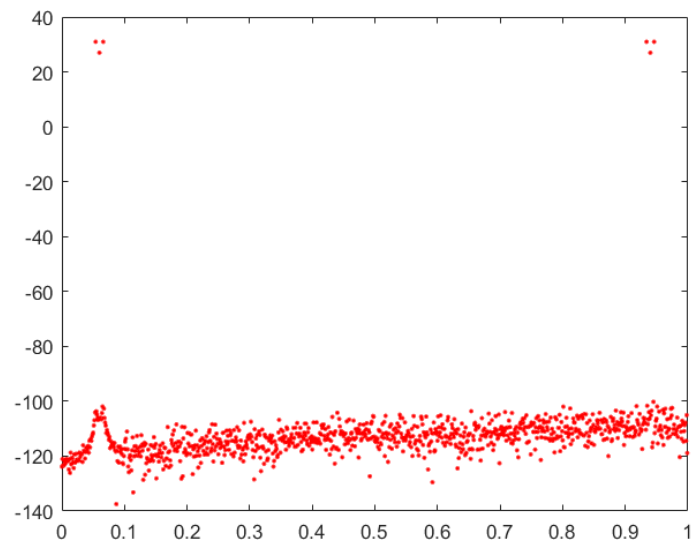
Wykres 7
c) $kP=70$



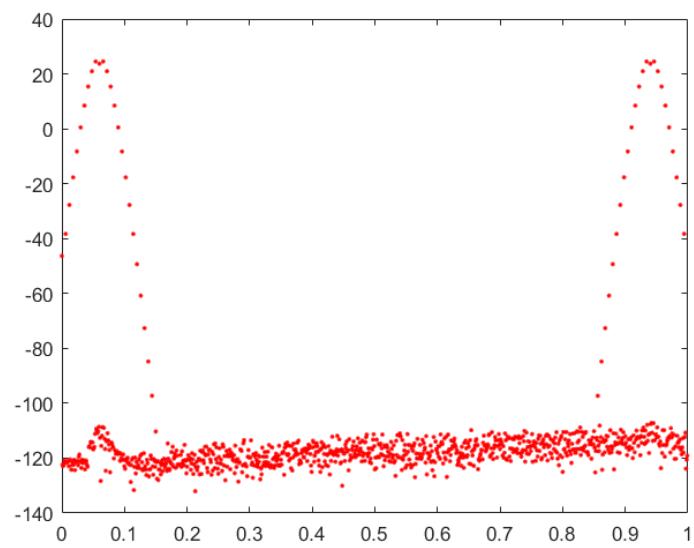
Wykres 8 Widmo $a)$
 $kA=0.5$



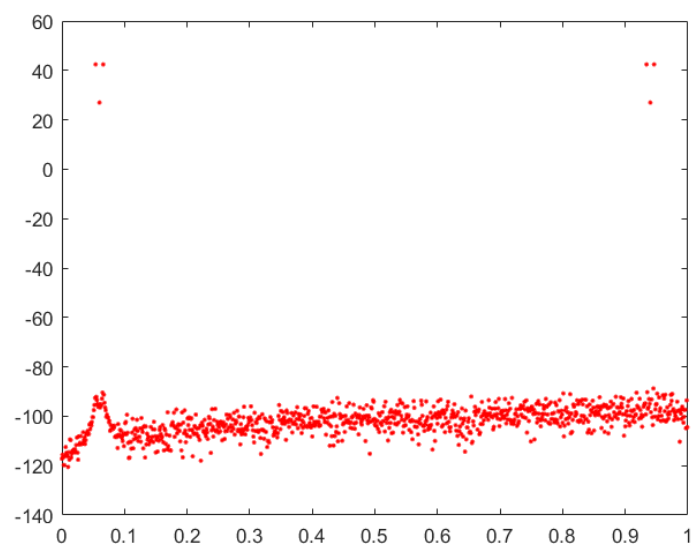
Wykres 9 Widmo $a)$
 $kP=1.5$



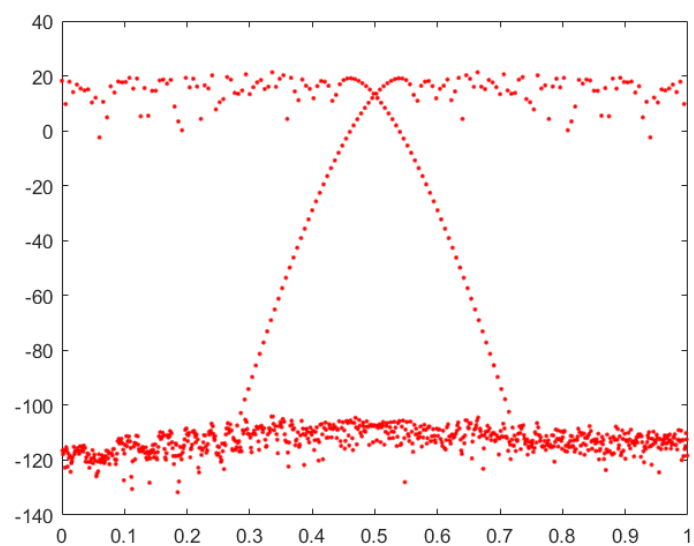
Wykres 10 Widmo
b) $kA=5$



Wykres 11 Widmo b)
 $kP=\pi/2$



Wykres 12 Widmo
c) $kA=70$



Wykres 13 Widmo c)
 $kP=70$