

Филтар непропусник

опсега учестаности

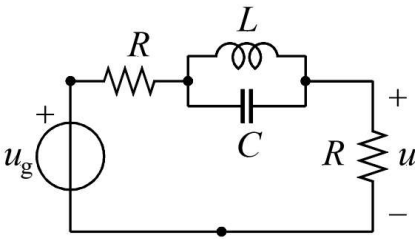
Figure 1: Bandstop filter

Вредности елемената електричног кола са слике су познате и постоји веза $L = R^2 C$.

(а) Одредити трансфер функцију (уопштену комплексну преносну функцију електричног кола, трансмитансу напона) $\underline{H}(s) = \frac{U(s)}{U_g(s)}$.

(б) Нацртати амплитудску карактеристику.

(в) Одредити пропусни опсег 3 dB.



```
(%i1) Hs: R/(R+1/(C*s+1/(L*s))+R), L=R^2*C,ratsimp;
```

```
(%o1) 
$$\frac{C^2 R^2 s^2 + 1}{2 C^2 R^2 s^2 + C R s + 2}$$

```

```
(%i2) assume(R>0, C>0, w>0);
```

```
(%o2) [R>0, C>0, w>0]
```

```
(%i3) Hw: ev(Hs, s=%i*w);
```

```
(%o3) 
$$\frac{1 - C^2 R^2 w^2}{-2 C^2 R^2 w^2 + \%i C R w + 2}$$

```

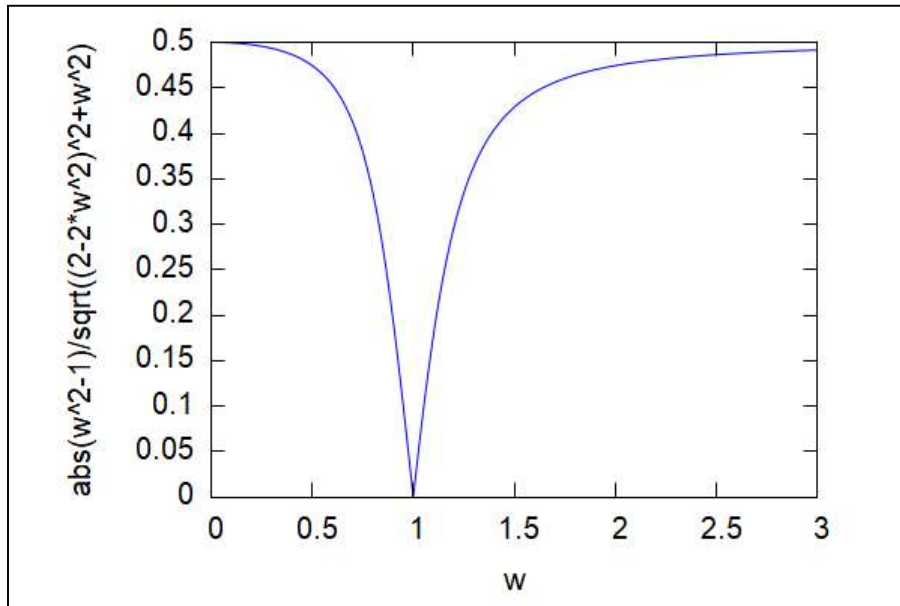
```
(%i4) M: cabs(Hw);
```

```
(%o4) 
$$\frac{\left| C^2 R^2 w^2 - 1 \right|}{\sqrt{(2 - 2 C^2 R^2 w^2)^2 + C^2 R^2 w^2}}$$

```

```
(%i5) wxplot2d(ev(M, [R=1, C=1]), [w, 0,3]);
```

```
(%t5)
```



```
(%o5)
```

```
(%i6) Aref: M,w=0;
```

```
(%o6)  $\frac{1}{2}$ 
```

```
(%i7) limit(M, w, inf);
```

```
(%o7)  $\frac{1}{2}$ 
```

```
(%i8) P0: Aref^2;
```

```
(%o8)  $\frac{1}{4}$ 
```

```
(%i9) P: Hw·subst(-w,w,Hw), ratsimp;
```

```
(%o9) 
$$\frac{C^4 R^4 w^4 - 2 C^2 R^2 w^2 + 1}{4 C^4 R^4 w^4 - 7 C^2 R^2 w^2 + 4}$$

```

```
(%i10) uslov: P=P0/2;
```

```
(%o10) 
$$\frac{C^4 R^4 w^4 - 2 C^2 R^2 w^2 + 1}{4 C^4 R^4 w^4 - 7 C^2 R^2 w^2 + 4} = \frac{1}{8}$$

```

```
(%i11) w3dB: solve(uslov, w);
```

```
(%o11) 
$$\left[ w = -\frac{\sqrt{\sqrt{17+9}}}{2^{3/2} C R}, w = -\frac{\sqrt{\sqrt{17+9}}}{2^{3/2} C R}, w = -\frac{\sqrt{9-\sqrt{17}}}{2^{3/2} C R}, w = \frac{\sqrt{9-\sqrt{17}}}{2^{3/2} C R} \right]$$

```

```
(%i12) wg1: w, w3dB[4];
```

```
(%o12) 
$$\frac{\sqrt{9-\sqrt{17}}}{2^{3/2} C R}$$

```

```
(%i13) float(wg1);
```

```
(%o13) 
$$\frac{0.780776406404415}{C R}$$

```

```
(%i14) wg2: w, w3dB[2];
```

```
(%o14) 
$$\frac{\sqrt{\sqrt{17+9}}}{2^{3/2} C R}$$

```

```
(%i15) float(wg2);
```

```
(%o15) 
$$\frac{1.280776406404415}{C R}$$

```

```
(%i16) float((-1+sqrt(17))/4);
```

```
(%o16) 0.7807764064044151
```

```
(%i17) float((1+sqrt(17))/4);
```

```
(%o17) 1.280776406404415
```