

# Bilinear Transformation Method

Question: Type I

Show that the bilinear transformation  $w = \frac{2z+3}{z-4}$  transforms  $x^2 + y^2 = 4x$  in the  $z$ -plane to

$4u + 3 = 0$  in  $w$ -plane.

Ans:- Consider  $x^2 + y^2 = 4x$  the circle in  $z$  plane

$$\therefore x^2 - 4x + y^2 = 0$$

$$x^2 - 4x + 4 + y^2 = 4$$

$$\therefore (x-2)^2 + (y-0)^2 = 2^2$$

Thus Centre of circle is  $C(h, k) \equiv C(2, 0)$

and radius is  $r = 2$

Thus in  $z$ -plane it is given as  $|z-2| = 2 \dots (1)$

Consider  $w = \frac{2z+3}{z-4}$

$$w(z-4) = 2z+3$$

$$wz - 4w = 2z + 3$$

$$wz - 2z = 4w + 3$$

$$z(w-2) = (4w+3)$$

$$\therefore z = \frac{4w+3}{w-2}$$

$$z-2 = \frac{4w+3}{w-2} - 2$$

$$|z-2| = \left| \frac{4w+3}{w-2} - 2 \right|$$

$$2 = \left| \frac{4w+3-2(w-2)}{w-2} \right|$$

...(from 1)

$$2 = \left| \frac{2w+7}{w-2} \right|$$

$$\therefore 2 = \frac{|2w+7|}{|w-2|}$$

$$\therefore 2|w-2| = |2w+7|$$



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The bilinear transformation is a mathematical mapping of variables. In digital filtering, it is a standard method of mapping the  $s$  or analog plane into the  $z$  or digital plane. It transforms analog filters, designed using classical filter design techniques, into their discrete equivalents. Description - Examples - Diagnostics - Algorithms. 2 Jan - 8 min - Uploaded by Ekeeda #InfiniteImpulseResponseIIRFilters #DTSP #DiscreteTimeSignalsProcessing. Video Lecture. For this reason, the transformation must provide that the left half of  $s$  plane coincides with the area within the unit circle of  $z$  plane, as shown in Figure One of most commonly used method of transforming analog filters into appropriate IIR filters is known as bilinear transformation. This chapter introduces the bilinear transformation method. The bilinear transformation method is explicitly illustrated by its application to the Korteweg de Vries. There's a popular analytical IIR filter design technique known as the bilinear transform method. Like the impulse invariance method, this design technique. 1 The Bilinear Transform; 2  $w$  Domain; 3 Prewarping; 4 Phase; 5 Filter Design We can use a technique called prewarping to account for the nonlinearity, and. Section 6: IIR discrete time filter design by bilinear transformation Firstly, we dispose quickly of one method that will not work. That is. Derivation; Mapping Properties of Bilinear Transformation; The Warping Effect Bilinear-Transformation Method, Chapter (McGraw-Hill Professional, ). The method is based on the bilinear transformation and it The bilinear transformation method has the following important features: 0 A stable. Convert to DT filter  $H(z)$  via bilinear transform such that.  $H(z) = H_c(s)$ . (2. Td Remarks: ? Direct method to go from  $H_c(s)$  to  $H(z)$  that always works without going. Iowa Hills Software Digital and Analog Filters IIR Filter Design Home. IIR Filter Design Using the Bilinear Transform. This page derives the equations used to. NPTEL provides E-learning through online Web and Video courses various streams. A good description on warping effect. Uet Peshwar Atd campus. Impulse invariant transformation. Bilinear transformation. Impulse invariant transformation: In this method the IIR filter is designed such that the. Purchase Bilinear Transformation Method, Volume - 1st Edition. Print Book & E-Book. ISBN , With the complex-frequency-shifted perfectly matched layer (CFS-PML) implemented based on both the stretched coordinates and the bilinear transform method.

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