

JAIPUR ENGINEERING COLLEGE AND RESEARCH CENTRE

Year & Sem – I Year & II Sem Subject – Engineering Mathematics-II Unit – I Presented by – (Dr.Vishal Saxena, Associate Professor)





VISION AND MISSION OF INSTITUTE

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- Identify based on informed perception of Indian, regional and global needs, the area of focus and provide platform to gain knowledge and solutions.
- Offer opportunities for interaction between academic and industry .
- Develop human potential to its fullest extent so that intellectually capable and imaginatively gifted leaders may emerge.

CONTENTS (TO BE COVERED)

Eigen values and Eigen vectors(examples)

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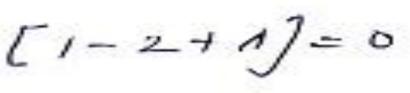
egen values and eigen nection of matrix B.3 Find the $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ 1A-1I/=0 -1 =0



(2-1) [(2-1) -1] + 1[-2+1+1]+1[1-2+1]=0 13-61+91-4=0 1= 1,1,4 For A=1

 $\begin{bmatrix} +1 & -1 & 1 \\ -1 & 1 & -1 \end{bmatrix} \begin{bmatrix} 1 & 1 \\ 1 & 2 \\ -1 & -1 \end{bmatrix} \begin{bmatrix} 1 & 1 \\ 2x_3 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$ 2, -2, +23=0 Let x2 = 0 , x2 = 1 x1 = 1

FZ let x3=1, 22=0 ⇒ x1=-1



So eigen vectors conversponding

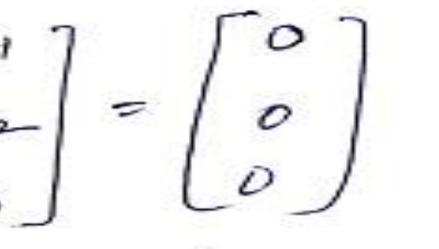
For 1= 4

 $\begin{array}{c} -1 & 1 \\ -2 & -1 \\ -1 & -2 \end{array} \begin{bmatrix} x_1 \\ x_2 \\ -1 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$



te







Eigen nector coursponding to $X_{2Z} \begin{bmatrix} 1\\-1\\1 \end{bmatrix}$

1=4 6

Q 5 Find the eigen values and eigen nectors of the following matrices $\begin{bmatrix} -2 & 1 & 1 \\ -1 & 4 & 5 \\ -1 & 1 & 0 \end{bmatrix}$ The characteristic eq? of A is Sol 1A-1=1=0 $\begin{vmatrix} -2-1 & 1 & 1 \\ -1' & 4-1 & 5 \\ -1 & 1 & 0-1 \end{vmatrix} = 0$ Dr. Vishal Saxena (Associate Professor, Deptt. of

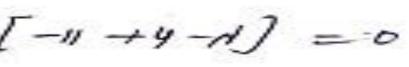
Mathematics), JECRC, JAIPUR

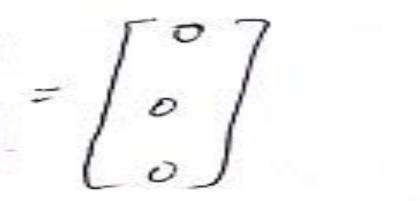
(-2-1) [-1(9-1)-5] - 1[111+5] +1[-11+4-1] =0 13-212-1+2=0 A = 1, -1, 2

For d=1 in 1A-171=0

 $\begin{bmatrix} -3 & i & j \\ -1 & 3 & 5 \\ -1 & j & -1 \end{bmatrix} \begin{bmatrix} \chi_1 \\ \chi_2 \\ \chi_3 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$

Applying R2 > R2 - 3R1





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 $K_2 \rightarrow K_3$

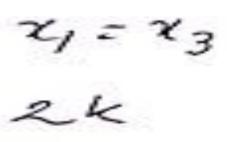
 $\begin{bmatrix} -3 & 1 & 1 \\ -2 & 0 & 2 \end{bmatrix} \begin{bmatrix} 4 \\ -2 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$

 $R_3 \rightarrow R_3 \neq R_2$

- 3x1 + x2 + 23 = 0 + 223 = 0 Let x3 = K = X1 = 72 = 2K







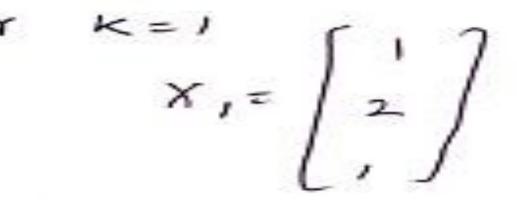
X, = | 2 E |

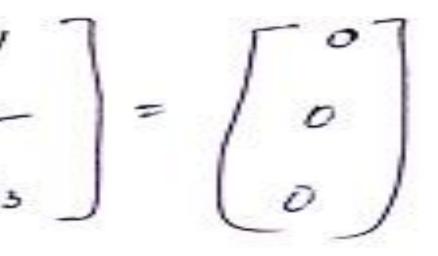
(ii) For A = -1 1A -1 I = 0

Γ-1	/	1	[z,
-11	5	5	12
L -1	,	/ /	L~
		,	

-5 RJ - K,

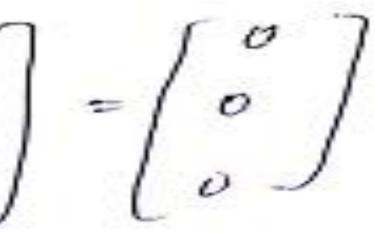
 $\begin{bmatrix} -i & i & j \\ -6 & 0 & o \end{bmatrix} \begin{bmatrix} z_1 \\ z_2 \end{bmatrix} = \begin{bmatrix} 0 \\ z_3 \end{bmatrix} \begin{bmatrix} 0 \\ z_4 \end{bmatrix}$







R3 AK3 -0 0 0 // x2 2+23=0 XI = = k, -~3 M KIII X2E 1 k, 1



D

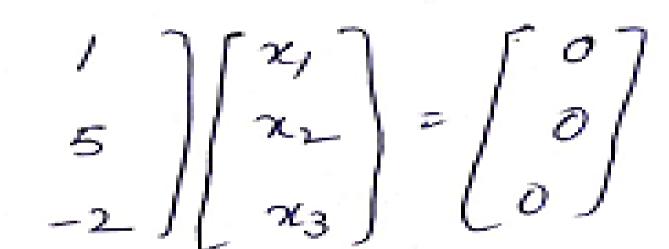


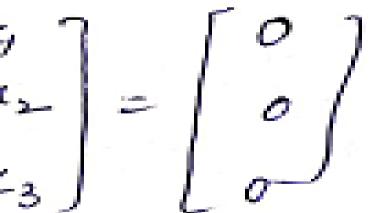
(iii) For 1=2

1A-1 I = 0

2 Rg JA2 $\begin{vmatrix} & & \\ 0 & & \\ & & & \\ & & & \\ &$

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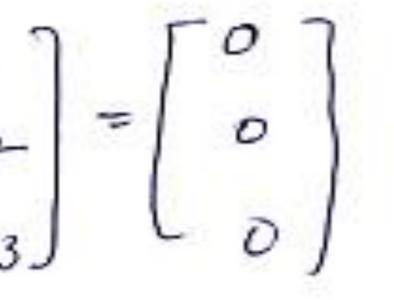




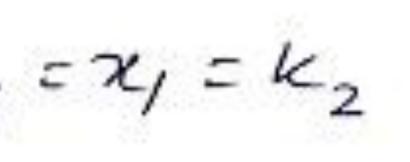
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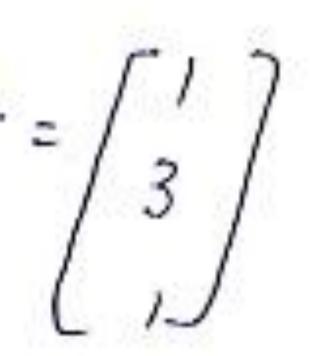
O On





= 0 -42, + 2, + 3 x3 = 0 -) 3Kn ĩ 21

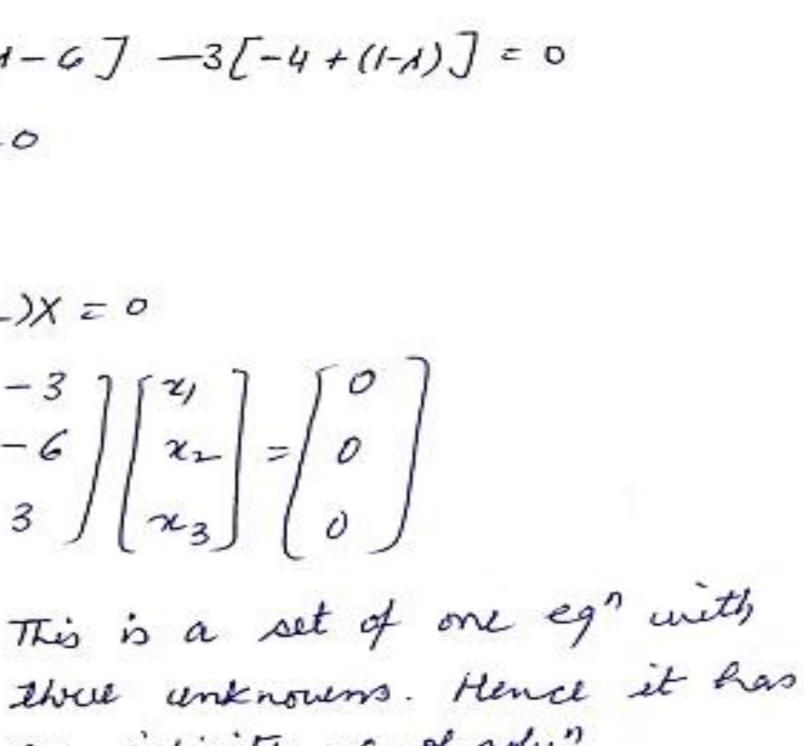




8.6 Find the eigen values and eigen vectors of 2 -3 A= / 2 1A-11/20 -3 = 0

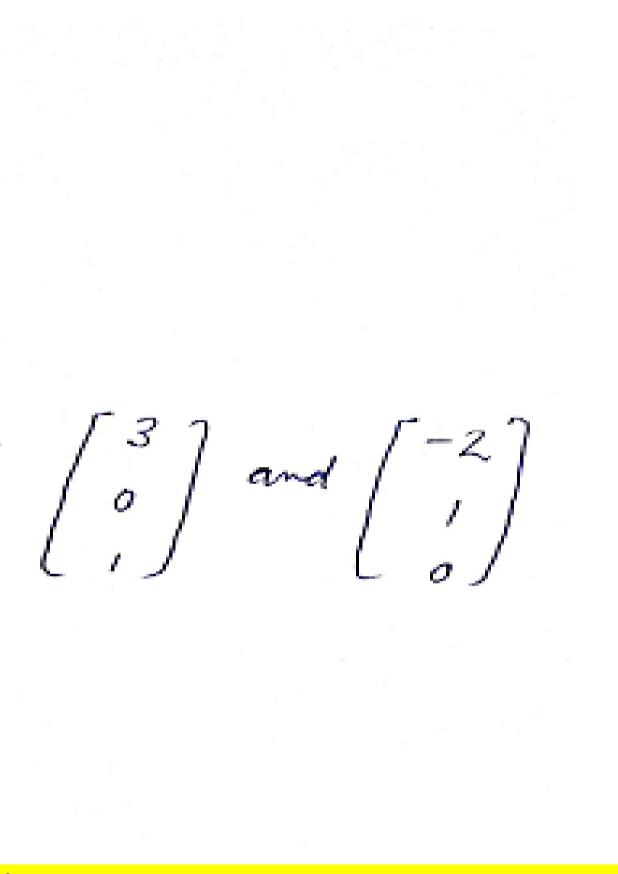
(-2-1)[-1(1-1)] - 12] - 2[-21 - 6] - 3[-4 + (1-1)] = 0 $1^3 + 1^2 - 211 - 45 = 0$ H+ 1=-3,-3,5

(y For 1=-3 (A-AI)X = O 24+22,-323=0 2x++4x2-6x3=0 an infinite no of solu" -x1 - 2x2 + 3x3=0

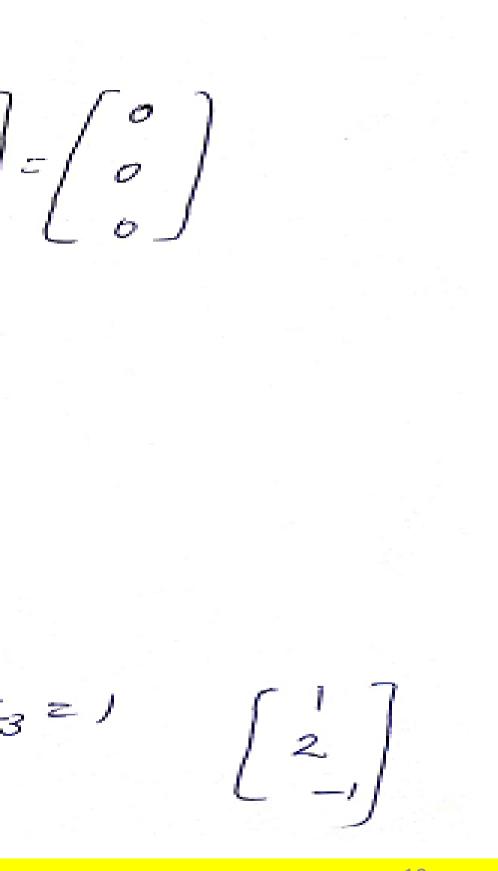


x+2x2-3x3=0 Choosing 22=0, 21,=3, 23=1 and x3=0 x1=-2, x2=1 vectors corresponding to 1= -3 is

 $\begin{bmatrix} 2k_2 \\ k_2 \\ k_1 \end{bmatrix}$



1ii) For 1=5 2 $-7x_{1}+2x_{2}-3x_{3}=0$ 24 - 42 - 62 = 0 Teking first two eg? $\frac{\chi_1}{-24} = \frac{\chi_2}{-48}$ $\frac{\chi_1}{-1} = \frac{\chi_2}{-2} = \frac{\chi_3}{1} = \frac{\chi_3}{1} = \frac{\chi_3}{1}$ For A = 5 $X_3 = \begin{bmatrix} -k_3 \\ -2k_3 \\ k_3 \end{bmatrix}$ For $k_3 = \begin{bmatrix} -k_3 \\ -2k_3 \\ k_3 \end{bmatrix}$



Refrences

- 1.Advanced Engineering Mathematics by Prof.ERWIN KREYSZIG (Ch.10, page no. 557-580)
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- 3.Advanced Engineering Mathematics by B.V RAMANA (Ch.20, pageno. 20.1. 20.5)
- **4.NPTEL Lectures available on**

http://www.infocobuild.com/education/audio-video-courses/m athematics/TransformTechniquesForEngineers-IIT-Madras/lecture-47.html



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