CMR INSTITUTE OF TECHNOLOGY

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Internal Assesment Test - I

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|---|---|---|---|---|---|---|---|---|
| Sub: | Calculus and Linear Algebra | | | | | | Code: | 18MAT 11 |
| Date: | 15/ 10 /2018 | Duration: | 90 mins | Max Marks: | 50 | Sem: I | Section: | A to F ,N and O |

**Question 1 is compulsory, Answer any 6 questions from 2 to8.**

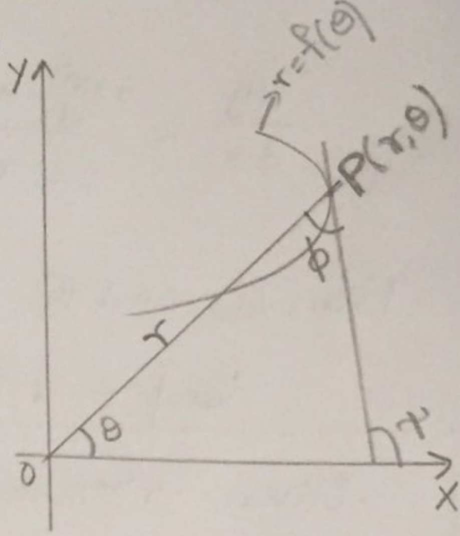
| | | Marks | OBE | |
|---|---|---|---|---|
| | | | CO | RBT |
| 1) | a) Derive with usual notations $\tan\phi = r\dfrac{d\theta}{dr}$ | [5] | CO1 | L3 |
| | b) Find the angle between the radius vector and tangent for the curve $r^2\cos 2\theta = a^2$. | [3] | CO1 | L3 |
| 2) | Find the pedal equation of the curve $r^m = a^m(\cos m\theta + \sin m\theta)$. | [7] | CO1 | L3 |
| 3) | Find the Radius of curvature of the given curve $y^2 = \dfrac{4a^2(2a-x)}{x}$ where the curve meets the x axis. | [7] | CO1 | L3 |

| | | | | |
|---|---|---|---|---|
| 4) | Find the coordinates of centre of curvature at any point of the parabola $y^2 = 4ax$. And hence show that the evolute is $27ay^2 = 4(x-2a)^3$. | [7] | CO1 | L3 |
| 5) | Solve the system of equations by Gauss-seidel method, carryout 4 iterations 2x+17y+4z=35 ; 28x+4y-z=32 ; x+3y+10z=24. | [7] | CO6 | L3 |
| 6) | Examine the following system for consistency and solve them if consistent, using Gauss elimination method 5x+y+z+w=4; x+7y+z+w=12; x+y+6z+w= -5; x+y+z+4w=-6. | [7] | CO6 | L3 |
| 7) | Reduce the matrix .to the diagonal form $\begin{bmatrix} -1 & 3 \\ -2 & 4 \end{bmatrix}$ . | [7] | CO6 | L3 |
| 8) | Find the largest eigenvalue and the corresponding eigenvector of the matrix A by using power method by taking initial vector as $[1,1,1]^T$ *and* $A = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$. | [7] | CO6 | L3 |

# Internal Assesment - 1 Solution.

## Calculus & Linear Algebra - 18MAT11

1.a Consider a polar curve $r = f(\theta)$ and a point $P(r,\theta)$ on the curve. Let PT be the tangent to the curve at P, meeting the X-axis at the point T.




Let $\psi$ be the angle made by the tangent with the +ve X-axis. and $\theta$ be the angle between the radius vector OP and the tangent PT. — (1)

From the figure we have, $\psi = \phi + \theta$

We know that $\frac{dy}{dx}$ = slope of the tangent.

Also slope $= \tan\psi$

$$\therefore \frac{dy}{dx} = \tan\psi = \tan(\phi+\theta)$$

$$\frac{dy}{dx} = \frac{\tan\phi + \tan\theta}{1 - \tan\phi\tan\theta} \longrightarrow (1) \qquad \text{—— (1)}$$

Since $(x,y)$ is the cartesian coordinates of the point P, we have $x = r\cos\theta$, & $y = r\sin\theta$

Then $\frac{dx}{d\theta} = -r\sin\theta + \cos\theta\frac{dr}{d\theta}$

and $\frac{dy}{d\theta} = r\cos\theta + \sin\theta\frac{dr}{d\theta}$

$$\therefore \frac{dy}{dx} = \frac{dy/d\theta}{dx/d\theta} = \frac{r\cos\theta + \sin\theta\frac{dr}{d\theta}}{-r\sin\theta + \cos\theta\frac{dr}{d\theta}} \qquad \text{—— (1)}$$

Dividing both Nr and Dr of RHS by $\cos\theta \frac{dr}{d\theta}$ (2)

we get, $\frac{dy}{dx} = \frac{r\frac{d\theta}{dr} + \tan\theta}{-r\frac{d\theta}{dr}\tan\theta + 1}$

$$\frac{dy}{dx} = \frac{r\frac{d\theta}{dr} + \tan\theta}{1 - r\frac{d\theta}{dr}\tan\theta} \longrightarrow (2)$$

— (2)

From (1) and (2) we get

$$\tan\phi = r\frac{d\theta}{dr}$$

1.b Given $r^2\cos 2\theta = a^2$

Taking log on BS

$2\log r + \log(\cos 2\theta) = 2\log a$ — (1)

Diff w.r.to $\theta$

$$2\frac{1}{r}\frac{dr}{d\theta} + \frac{1}{\cos 2\theta}(-\sin 2\theta)2 = 0$$

$\frac{1}{r}\frac{dr}{d\theta} = \tan 2\theta$ — (1)

we have $\cot\phi = \frac{1}{r}\frac{dr}{d\theta}$

$\therefore \cot\phi = \tan 2\theta$ ~~= tan(~~

$\cot\phi = \cot\left(\frac{\pi}{2} - 2\theta\right)$

$\Rightarrow \phi = \frac{\pi}{2} - 2\theta$ — (1)

2 Given $r^m = a^m(\cos m\theta + \sin m\theta) \longrightarrow (1)$

Taking log on BS

$m\log r = m\log a + \log(\cos m\theta + \sin m\theta)$ — (2)

Diff w.r.to $\theta$

$$m\frac{1}{r}\frac{dr}{d\theta} = 0 + \frac{1}{\cos m\theta + \sin m\theta}(-\sin m\theta + \cos m\theta)m$$

$$\frac{1}{r}\frac{dr}{d\theta} = \frac{\cos m\theta - \sin m\theta}{\cos m\theta + \sin m\theta}$$

Dividing both Nr & Dr of RHS by $\cos m\theta$

$$\frac{1}{r}\frac{dr}{d\theta} = \frac{1-\tan m\theta}{1+\tan m\theta}$$

$$\frac{1}{r}\frac{dr}{d\theta} = \tan\left(\frac{\pi}{4} - m\theta\right)$$

We have $\cot\phi = \frac{1}{r}\frac{dr}{d\theta}$

$$\therefore \cot\phi = \tan\left(\frac{\pi}{4} - m\theta\right)$$

$$= \cot\left(\frac{\pi}{2} - \frac{\pi}{4} + m\theta\right)$$

$$\cot\phi = \cot\left(\frac{\pi}{4} + m\theta\right) \quad (2)$$

$$\Rightarrow \phi = \frac{\pi}{4} + m\theta$$

Consider $p = r\sin\phi$

$$p = r\sin\left(\frac{\pi}{4} + m\theta\right)$$

$$= r\left[\sin\frac{\pi}{4}\cos m\theta + \cos\frac{\pi}{4}\sin m\theta\right]$$

$$p = \frac{r}{\sqrt{2}}\left[\cos m\theta + \sin m\theta\right]$$

(2)

From ① $\frac{r^m}{a^m} = \cos m\theta + \sin m\theta$

$$\therefore p = \frac{r}{\sqrt{2}}\frac{r^m}{a^m} = \frac{r^{m+1}}{a^m\sqrt{2}}$$

$$\Rightarrow \underline{\underline{r^{m+1} = pa^m\sqrt{2}}} \quad (1)$$

3 Given $y^2 = \frac{4a^2(2a-x)}{x}$ 4

The curve meets the $x$-axis $\Rightarrow y = 0$.

$$\therefore \frac{4a^2(2a-x)}{x} = 0 \Rightarrow 4a^2(2a-x) = 0$$

$$\Rightarrow x = 2a$$

Thus $(2a, 0)$ is the point on the curve. — (1)

$$y^2 = \frac{4a^2(2a-x)}{x}$$

Diff w.r.to $x$

$$2yy_1 = \frac{x[4a^2(0-1)] - 4a^2(2a-x)(1)}{x^2}$$

$$= \frac{-\cancel{4a^2x} - 8a^3 + \cancel{4a^2x}}{x^2}$$

$$2yy_1 = \frac{-8a^3}{x^2}$$

$$y_1 = \frac{-4a^3}{x^2y}$$

At $(2a, 0)$, $y_1 = \infty$ — (2)

Now $x_1 = \frac{dx}{dy} = \frac{1}{dy/dx} = \frac{1}{y_1} = \frac{-x^2y}{4a^3}$

At $(2a, 0)$, $\boxed{x_1 = 0}$ — (1)

$$x_2 = \frac{-1}{4a^3}[x^2y_1 + y2x]$$

$$= \frac{-1}{4a^3}[x^2y_1 + 2xy]$$

At $(2a, 0)$

$$x_2 = -$$

(5)

$$x_2 = \frac{-1}{4a^3}\left[x^2 + y\,2x x_1\right]$$

At $(2a, 0)$

$$x_2 = \frac{-1}{4a^3}\left[4a^2 + 0\right]$$

$$= \frac{-1}{a} \quad \text{— (1)}$$

$$\rho = \frac{(1+x_1^2)^{3/2}}{x_2} \quad \text{— (1)}$$

$$= \frac{(1+0)^{3/2}}{-1/a}$$

$$\rho = -a$$

$$|\rho| = a \quad \text{— (1)}$$

4

$$y^2 = 4ax$$

$$2yy_1 = 4a$$

$$y_1 = \frac{4a}{2y} = \frac{2a}{y} \quad \text{— (1)}$$

$$y_2 = 2a\left(\frac{-1}{y^2}\right)y_1$$

$$y_2 = -\frac{2a}{y^2}\left(\frac{2a}{y}\right) = \frac{-4a^2}{y^3} \quad \text{— (1)}$$

$$\bar{x} = x - \frac{y_1(1+y_1^2)}{y_2} \quad \text{— (1/2)}$$

$$= x + \frac{\left(\frac{2a}{y}\right)\left(1 + \frac{4a^2}{y^2}\right)}{-4a^2/y^3}$$

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$$\bar{x} = x + \frac{1}{2a}\left(4ax + 4a^2\right)$$

$$\bar{x} = 3x + 2a \quad \text{— (1)}$$

$$\bar{y} = y + \frac{(1+y_1^2)}{y_2} \quad \text{— (1/2)}$$

$$= y + \frac{\left(1 + \frac{4a^2}{y^2}\right)}{-4a^2/y^3}$$

$$\bar{y} = y - \frac{y}{4a^2}\left(y^2 + 4a^2\right)$$

$$= \frac{\cancel{4a^2y} - y^3 - \cancel{4a^2y}}{4a^2}$$

$$= \frac{-y^3}{4a^2} = \frac{-2x^{3/2}}{\sqrt{a}} \quad \text{— (1)}$$

∴ The coordinates of centre of curvature are

$$\bar{x} = 3x + 2a \rightarrow 1$$

$$\bar{y} = \frac{-2x^{3/2}}{\sqrt{a}} \rightarrow 2$$

To find evolute we have to eliminate $x$ from 1 & 2.

— (2)

From 2 & $(\bar{y})^2 = \frac{4x^3}{a}$

[∵ From 1 $x = \frac{\bar{x} - 2a}{3}$]

$$\Rightarrow (\bar{y})^2 = \frac{4}{a}\left(\frac{\bar{x} - 2a}{3}\right)^3$$

$$\Rightarrow (\bar{y})^2 = \frac{4(\bar{x} - 2a)^3}{27a}$$

$$\Rightarrow 27a(\bar{y})^2 = 4(\bar{x} - 2a)^3$$

∴ The evolute is

$$27ay^2 = 4(x - 2a)^3$$

5. $2x + 17y + 4z = 35$
$28x + 4y - z = 32$
$x + 3y + 10z = 24$

The given system is not diagonally dominant
We re-arrange the equations to make it
diagonally dominant.

$28x + 4y - z = 32$ $\quad |28| > |4| + |-1|$
$2x + 17y + 4z = 35$ $\quad |17| > |2| + |4|$
$x + 3y + 10z = 24$ $\quad |10| > |1| + |3|$

Now, the system is diagonally dominant.

(1)

Thus,
$$\left.\begin{aligned} x &= \frac{1}{28}(32 - 4y + z) \\ y &= \frac{1}{17}(35 - 2x - 4z) \\ z &= \frac{1}{10}(24 - x - 3y) \end{aligned}\right\} \text{— (1)}$$

Let $(x_0, y_0, z_0) = (0, 0, 0)$.

Iteration (1):-
$$\left.\begin{aligned} x_1 &= \frac{1}{28}[32 - 4(0) + 0] = 1.14286 \\ y_1 &= \frac{1}{17}[35 - 2(0) - 4(0)] = 2.0588 \\ z_1 &= \frac{1}{10}[24 - 0 - 3(0)] = 2.4 \end{aligned}\right\} \text{— (1)}$$

Iteration (2):-
$$\left.\begin{aligned} x_2 &= \frac{1}{28}(32 - 4y_1 + z_1) = 0.93446 \\ y_2 &= \frac{1}{17}(35 - 2x_2 - 4z_1) = 1.38418 \\ z_2 &= \frac{1}{10}(24 - x_2 - 3y_2) = 1.8913 \end{aligned}\right\} \text{— (1)}$$

Iteration (3):-

$$x_3 = \frac{1}{28}\left[32 - 4y_2 + z_2\right] = 1.01266$$

$$y_3 = \frac{1}{17}\left[35 - 2x_3 - 4z_2\right] = 1.4947$$

$$z_3 = \frac{1}{10}\left[24 - x_3 - 3y_3\right] = 1.850324$$

(8) — (1)

Iteration (4):-

$$x_4 = \frac{1}{28}\left[32 - 4y_3 + z_3\right] = 0.9954$$

$$y_4 = \frac{1}{17}\left[35 - 2x_4 - 4z_3\right] = 1.50635$$

$$z_4 = \frac{1}{10}\left[24 - x_4 - 3y_4\right] = 1.84855$$

— (1)

$\therefore x = 0.9954$

$y = 1.50635$

$z = 1.8485$

— (1)

6. $5x+y+z+w=4$
$x+7y+z+w=12$
$x+y+6z+w=-5$
$x+y+z+4w=-6.$

The augmented matrix is,

$$(A:B) = \left(\begin{array}{cccc|c} 5 & 1 & 1 & 1 & 4 \\ 1 & 7 & 1 & 1 & 12 \\ 1 & 1 & 6 & 1 & -5 \\ 1 & 1 & 1 & 4 & -6 \end{array}\right) \quad \text{— (1)}$$

$R_1 \leftrightarrow R_2$

$$\sim \left(\begin{array}{cccc|c} 1 & 7 & 1 & 1 & 12 \\ 5 & 1 & 1 & 1 & 4 \\ 1 & 1 & 6 & 1 & -5 \\ 1 & 1 & 1 & 4 & -6 \end{array}\right)$$

$R_2 \to 5R_1 - R_2$, $R_3 \to R_1 - R_3$, $R_4 \to R_1 - R_4$

$$\sim \left(\begin{array}{cccc|c} 1 & 7 & 1 & 1 & 12 \\ 0 & 34 & 4 & 4 & 56 \\ 0 & 6 & -5 & 0 & 17 \\ 0 & 6 & 0 & -3 & 18 \end{array}\right)$$

$R_2 \to \frac{1}{34} R_2$

$$\sim \left(\begin{array}{cccc|c} 1 & 7 & 1 & 1 & 12 \\ 0 & 1 & 2/17 & 2/17 & 28/17 \\ 0 & 6 & -5 & 0 & 17 \\ 0 & 6 & 0 & -3 & 18 \end{array}\right)$$

$R_3 \longrightarrow 6R_2 - R_3, \quad R_4 \longrightarrow 6R_2 - R_4$

$$\sim \left(\begin{array}{cccc|c} 1 & 7 & 1 & 1 & 12 \\ 0 & 1 & 2/17 & 2/17 & 28/17 \\ 0 & 0 & 97/17 & 12/17 & -121/17 \\ 0 & 0 & 12/17 & 63/17 & \frac{-138}{17} \end{array}\right)$$

$R_3 \rightarrow 17R_3, \quad R_4 \rightarrow 17R_4$

$$\sim \left(\begin{array}{cccc|c} 1 & 7 & 1 & 1 & 12 \\ 0 & 1 & 2/17 & 2/17 & 28/17 \\ 0 & 0 & 97 & 12 & -121 \\ 0 & 0 & 12 & 63 & -138 \end{array}\right)$$

— (3)

$R_4 \longrightarrow 12R_3 - 97R_4$

$$\sim \left(\begin{array}{ccccc} 1 & 7 & 1 & 1 & 12 \\ 0 & 1 & 2/17 & 2/17 & 28/17 \\ 0 & 0 & 97 & 12 & -121 \\ 0 & 0 & 0 & -5967 & 11934 \end{array}\right)$$

(1)

$r = r' = 4$. The system is consistent and has unique solution.

$\Rightarrow -5967\,w = 11934$

$$w = \frac{11934}{-5967} = -2$$

(2)

$$\begin{cases} x = 1 \\ y = 2 \\ z = -1 \\ w = -2 \end{cases}$$

$97z + 12w = -121$

$$\Rightarrow z = \frac{1}{97}\left(-121 - 12(-2)\right) = -1.$$

Also, $y + \frac{2}{17}z + \frac{2}{17}w = \frac{28}{17} \Rightarrow y = \frac{28}{17} - \frac{2}{17}(-1) - \frac{2}{17}(-2)$
$= 2$

And $x + 7y + z + w = 12 \Rightarrow x = 12 - 14 + 1 + 2 = 1.$

(11)

7. Let $A = \begin{pmatrix} -1 & 3 \\ -2 & 4 \end{pmatrix}$

The characteristic equation is

$$|A - \lambda I| = 0$$

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

$$(-1-\lambda)(4-\lambda) + 6 = 0$$

$$\Rightarrow -4 + \lambda - 4\lambda + \lambda^2 + 6 = 0$$

$$\Rightarrow \lambda^2 - 3\lambda + 2 = 0$$

$$\Rightarrow \lambda^2 - 2\lambda - 1\lambda + 2 = 0$$

$$\Rightarrow \lambda(\lambda - 2) - 1(\lambda - 2) = 0$$

$$\Rightarrow \lambda = 1, 2.$$ (2)

The eigenvalues are 1, 2.

The matrix equation is

$$(A - \lambda I) X = 0$$

$$\Rightarrow \begin{pmatrix} -1-\lambda & 3 \\ -2 & 4-\lambda \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$$

$$\Rightarrow (-1-\lambda)x + 3y = 0$$

$$-2x + (4-\lambda)y = 0.$$

Let $\lambda = 1$

$$-2x + 3y = 0$$

$$-2x + 3y = 0$$

$n = 2$

$$\begin{pmatrix} -2 & 3 \\ -2 & 3 \end{pmatrix} \underset{\sim}{R_2 \to R_1 - R_2} \begin{pmatrix} -2 & 3 \\ 0 & 0 \end{pmatrix}$$ (12)

$n - r = 2 - 1$ $\quad r = 1.$

$= 1$

Let $y = k_1$, $k_1 \neq 0$

$\Rightarrow x = \frac{3}{2} k_1$

Let $k_1 = 2.$

$\therefore X_1 = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$ — $(1\frac{1}{2})$

Let $\lambda = 2$

$-3x + 3y = 0$ $\quad n = 2$

$-2x + 2y = 0$

$$\begin{pmatrix} -3 & 3 \\ -2 & 2 \end{pmatrix} \underset{\sim}{R_2 \to (-2)R_1 + (+3)R_2} \begin{pmatrix} -3 & 3 \\ 0 & 0 \end{pmatrix}$$

Let $y = k_2$, $k_2 \neq 0.$ $\quad r = 1.$

$\Rightarrow x = k_2.$

Let $k_2 = 1$

$\therefore X_2 = \begin{pmatrix} 1 \\ 1 \end{pmatrix}$ — $(1\frac{1}{2})$

The modal matrix is $P = \begin{pmatrix} 3 & 1 \\ 2 & 1 \end{pmatrix}$

$$\therefore P^{-1} = \frac{1}{1}\begin{pmatrix} 1 & -1 \\ -2 & 3 \end{pmatrix}$$

$$P^{-1}AP = \begin{pmatrix} 1 & -1 \\ -2 & 3 \end{pmatrix}\begin{pmatrix} -1 & 3 \\ -2 & 4 \end{pmatrix}\begin{pmatrix} 3 & 1 \\ 2 & 1 \end{pmatrix}$$

$$= \begin{pmatrix} -1+2 & 3-4 \\ 2-6 & -6+12 \end{pmatrix}\begin{pmatrix} 3 & 1 \\ 2 & 1 \end{pmatrix}$$

$$= \begin{pmatrix} 1 & -1 \\ -4 & 6 \end{pmatrix}\begin{pmatrix} 3 & 1 \\ 2 & 1 \end{pmatrix}$$

$$= \begin{pmatrix} 3-2 & 1-1 \\ -12+12 & -4+6 \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 2 \end{pmatrix}$$

(2)

$$= \mathrm{Diag}\,(1, 2) = D.$$

8. By data $x^{(0)} = \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$

$$Ax^{(0)} = \begin{pmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{pmatrix}\begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} = \begin{pmatrix} 1 \\ 0 \\ 1 \end{pmatrix} = 1\begin{pmatrix} 1 \\ 0 \\ 1 \end{pmatrix}$$

$$= \lambda_1 X_1$$

$$AX_1 = \begin{pmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{pmatrix}\begin{pmatrix} 1 \\ 0 \\ 1 \end{pmatrix} = \begin{pmatrix} 2 \\ -2 \\ 2 \end{pmatrix} = 2\begin{pmatrix} 1 \\ -1 \\ 1 \end{pmatrix}$$

$$= \lambda_2 X_2$$

$$AX_2 = \begin{pmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{pmatrix}\begin{pmatrix} 1 \\ -1 \\ 1 \end{pmatrix} = \begin{pmatrix} 3 \\ -4 \\ 3 \end{pmatrix} = 4\begin{pmatrix} 0.75 \\ -1 \\ 0.75 \end{pmatrix}$$

$$= \lambda_3 X_3$$

$$Ax_3 = \begin{pmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{pmatrix} \begin{pmatrix} 0.75 \\ -1 \\ 0.75 \end{pmatrix} = \begin{pmatrix} 2.5 \\ -3.5 \\ 2.5 \end{pmatrix} = 3.5 \begin{pmatrix} 0.71 \\ -1 \\ 0.71 \end{pmatrix}$$

$$= \lambda_4 x_4$$

$$Ax_4 = \begin{pmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{pmatrix} \begin{pmatrix} 0.71 \\ -1 \\ 0.71 \end{pmatrix} = \begin{pmatrix} 2.42 \\ -3.42 \\ 2.42 \end{pmatrix} = 3.42 \begin{pmatrix} 0.708 \\ -1 \\ 0.708 \end{pmatrix}$$

$$= \lambda_5 x_5$$

$$Ax_5 = \begin{pmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{pmatrix} \begin{pmatrix} 0.708 \\ -1 \\ 0.708 \end{pmatrix} = \begin{pmatrix} 2.416 \\ -3.416 \\ 2.416 \end{pmatrix} = 3.416 \begin{pmatrix} 0.7073 \\ -1 \\ 0.7073 \end{pmatrix}$$

$$= \lambda_6 x_6$$

$$Ax_6 = \begin{pmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{pmatrix} \begin{pmatrix} 0.7073 \\ -1 \\ 0.7073 \end{pmatrix} = \begin{pmatrix} 2.4146 \\ -3.4146 \\ 2.4146 \end{pmatrix}$$ (5)

$$= 3.4146 \begin{pmatrix} 0.7071 \\ -1 \\ 0.7071 \end{pmatrix}$$ +

$$= \lambda_7 x_7$$

Largest eigenvalue = 3.4146

Corresponding eigenvector = $\begin{pmatrix} 0.7071 \\ -1 \\ 0.7071 \end{pmatrix}$ $\Big\}$ – (2)