

Answer the following questions:

[Total Marks : 60]

(1) (a) Express  $\frac{4x}{x^3-x^2-x+1}$  in partial fraction

$$\begin{aligned} & (x-1)^2(x+1) \\ & (x^2+1+2x)(x+1) \\ & x^3+x^2+x+1-2x^2-2x \\ & x^3-x^2-x+1 \end{aligned}$$

(b) Resolve into partial fraction  $\frac{2x}{x^2+2x-3}$

$$x^2+2x-3 = (x+3)(x-1)$$

(2)(a) Determine if the series convergence or divergence :

$$\sum_{n=0}^{\infty} \frac{n!}{5^n}, \quad \sum_{n=0}^{\infty} \frac{n^2-1}{10+5n^2}$$

(b) Does the infinite series  $\sum_{k=2}^{\infty} \frac{2}{k^2-1}$  have a limiting sum?

If so, what is its value?

(c) Determine the radius of convergence and interval of

convergence for the power series  $\sum_{n=1}^{\infty} \frac{(x-2)^n}{n5^n}$ .

(3) Solve the following differential equations :

(i)  $y(2x-1)dx + (x^2-x)dy = 0$

(ii)  $\frac{dy}{dx} = \frac{x^3+3y^3}{xy^2}$

(iii)  $(2x + e^y)dx + xe^y dy = 0$

(iv)  $\frac{dy}{dx} - \frac{1}{x}y = x^2$

(4) (a) Find the inverse of the matrix :  $A = \begin{bmatrix} 3 & 5 \\ 1 & 2 \end{bmatrix}$ ,

show that  $AA^{-1} = I$ .

(b) Find the eigenvalues and the eigenvectors of the matrix

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

With my best wishes &

Prof.A.R.Shehata.

Answer the following questions: [Total Marks : 60]

(1) (a) Express  $\frac{4x}{x^3-x^2-x+1}$  in partial fraction .

(b) Resolve into partial fraction  $\frac{6x+7}{x^2-x-6}$  .

(2) (a) Determine if the series converge or diverge :

$$\sum_{n=0}^{\infty} \frac{n!}{5^n} \quad , \quad \sum_{n=0}^{\infty} \frac{4n^2-1}{10+5n^2} .$$

(b) Determine the radius of convergence and interval of convergence for the power series  $\sum_{n=1}^{\infty} \frac{(-1)^n n}{4^n} (x+3)^n$ .

(3) Solve the following differential equations :

(i)  $x \cos y dx - e^{-x} \sec y dy = 0$ .

(ii)  $\frac{dy}{dx} = \frac{x+y-1}{x-y+1}$ .

(iii)  $(e^{x+y} + ye^y)dx + (xe^y - 1)dy = 0$ .

(iv)  $\frac{dy}{dx} + (\cot x)y = \cos x$ .

(4) (a) Solve the equations using the inverse matrix method:  
 $5x + y = 13$  ,  $3x + 2y = 5$ .

(b) Find the eigenvalues and the eigenvectors of the matrix

$$A = \begin{bmatrix} 1 & 2 \\ -1 & 4 \end{bmatrix}.$$

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Dr.A.R.Shehata.

Answer the following questions: [Total Marks : 60]

(1) (a) Express  $\frac{x^2+3x-1}{(x+1)(x^2+2)}$  in partial fraction.

(b) Resolve into partial fraction  $\frac{6x+7}{x^2-x-6}$ .

(2) (a) Determine if the series converge or diverge :

$$\sum_{n=0}^{\infty} \frac{n!}{6^n}, \quad \sum_{n=0}^{\infty} \frac{3n^2-1}{10+5n^2}.$$

(b) Determine the radius of convergence and interval of convergence for the power series  $\sum_{n=1}^{\infty} \frac{2^n}{n} (4x-8)^n$ .

(3) Solve the following differential equations :

(i)  $2x dy = y dx$ .

(ii)  $\frac{dy}{dx} = \frac{x^3+3y^3}{xy^2}$ .

(iii)  $(2x + y^2)dx + 2xydy = 0$ .

(4) (a) Solve the equations using the inverse matrix method:  
 $3x + 2y = -2, \quad x + 4y = 6.$

(b) Find the eigenvalues and the eigenvectors of the matrix

$$A = \begin{bmatrix} 1 & 2 \\ 3 & 2 \end{bmatrix}.$$

Best Wishes & Dr. Abd El Rahman Shabara

*(Signature)*



Answer the following questions:

[Total Marks : 60]

(1) (a) Express  $\frac{4x}{x^3 - x^2 - x + 1}$  in partial fraction.

(b) Resolve into partial fraction  $\frac{6x+7}{x^2-x-6}$ .

(2) (a) Determine if the series converge or diverge :

$$\sum_{n=0}^{\infty} \frac{n!}{5^n}, \quad \sum_{n=0}^{\infty} \frac{4n^2-1}{10+5n^2}$$

(b) Determine the radius of convergence and interval of

convergence for the power series  $\sum_{n=1}^{\infty} \frac{(-1)^n n}{4^n} (x+3)^n$ .

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(4) (a) Solve the equations using the inverse matrix method:

$$5x + y = 13, \quad 3x + 2y = 5.$$

(b) Find the eigenvalues and the eigenvectors of the matrix

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

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Answer the following questions: [Total Marks : 60]

(1) (a) Express  $\frac{x+3}{x(x-1)^2}$  in partial fraction .

(b) Resolve into partial fraction  $\frac{x-13}{x^2+2x-3}$  .

(2)(a) Determine if the sequences converge or diverge :

$$\left\{ \frac{3n^2-1}{10n+5n^2} \right\}_{n=2}^{\infty}, \{(-1)^n\}_{n=0}^{\infty}.$$

(b) Determine if the series converge or diverge :

$$\sum_{n=0}^{\infty} \frac{n!}{3^n}, \sum_{n=0}^{\infty} \frac{4n^2-1}{10+5n^2}.$$

(3) Solve the following differential equations :

(i)  $2xdy = y(x+1)dx.$

(ii)  $\frac{dy}{dx} = \frac{x^2+3y^2}{xy}.$

(iii)  $(e^{x+y} + ye^y)dx + (xe^y - 1)dy = 0.$

(iv)  $\frac{dy}{dx} + (\cot x)y = \cos x.$

(4) (a) Solve the equations using the inverse matrix method:

$$5x + y = 13, \quad 3x + 2y = 5.$$

(b) Find the eigenvalues and the eigenvectors of the matrix

$$A = \begin{bmatrix} 4 & 3 \\ 1 & 2 \end{bmatrix}.$$

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Answer the following questions:

[Total Marks : 60]

(1) (a) Express  $\frac{2x}{x^4-1}$  in partial fraction .

(b) Resolve into partial fraction  $\frac{7x-23}{x^2-7x+12}$  .

(2)(a) Graph the sequences:

$$\left\{ \frac{n+1}{n^2} \right\}_{n=1}^{\infty}, \left\{ \frac{(-1)^{n+1}}{2^n} \right\}_{n=0}^{\infty}.$$

(b) Determine if the series convergence or divergence :

$$\sum_{n=1}^{\infty} \frac{n}{3^n}, \sum_{n=0}^{\infty} \frac{n^2-1}{10+5n^2}.$$

(3) Solve the following differential equations :

(i)  $2x dy = y dx$ .

(ii)  $\frac{dy}{dx} = \frac{x^3+3y^3}{xy^2}$  .

(iii)  $(2x + y^2)dx + 2xydy = 0$ .

(iv)  $\frac{dy}{dx} - \frac{1}{x}y = x^2$  .

(4) (a) Find the inverse of the matrix :  $A = \begin{bmatrix} 4 & 3 \\ 1 & 2 \end{bmatrix}$ ,

show that  $A A^{-1} = I$ .

(b) Find the eigenvalues and the eigenvectors of the matrix

$$A = \begin{bmatrix} 1 & 2 \\ -1 & 4 \end{bmatrix}.$$

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