J.J COLLEGE OF ENGINEERING AND TECHNOLOGY

Approved by AICTE | Affiliated to Anna University | ISO 9001 : 2015 Certified
Accredited by NAAC with A Grade

SOWDAMBIKAA GROUP OF INSTITUTIONS

ESTD. 1994

INSTITUTION'S INNOVATION COUNCIL (Ministry of Education Initiative)

EC-COUNCIL

30 years
Excellence through ENGINEERING

TÜVRheinland CERTIFIED

NATIONAL CYBER SAFETY AND SECURITY STANDARDS

DEPARTMENT OF MATHEMATICS

MA3351- TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS

QUESTION BANK

R - 2021

INSTITUTE VISION & MISSION

VISION:

To become a globally recognized "Centre of Academic Excellence" providing Quality Education to all students.

MISSION:

To provide Quality Education in the fields of Engineering, Management, Information, Technology and other Engineering areas.

DEPARTMENT VISION & MISSION

VISION:

To merge as a world-class hub of research that creates an academic pursuit and disseminates knowledge with high standards in Mathematics, Engineering, and Technology.

MISSION:

- To impart world-class education in an environment of fundamental and applied research in Mathematics.
- To prepare the professional groups in Mathematics to support the national development programs within the public and canters of higher learning.
- To develop human potential to its fullest extent so that scholarly competent and very talented captains can emerge in various professions.

PROGRAM OUTCOMES (POs):

PO1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineeringfundamentalsandanengineeringspecializationtothesolutionof complex engineering problems.
PO2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions Using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including the design of experiments, Analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex Engineering activities with an understanding of the limitations.
PO6	**The engineer and society:** Apply to reason in formed by the contextual Knowledge to assess societal, health, safety, legal and cultural issues and the Consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and Responsibilities and norms of the engineering practice.
PO9	**Individual and team work:** Function effectively as an individual, and as a Member or leader in Diverse teams, and in multidisciplinary settings.
PO10	**Communication:**Communicateeffectivelyoncomplexengineeringactivities with the engineering community and with society at large, such as, being able To comprehend And write effective reports and design documentation, make effective presentations, and give and Receive clear instructions.

PO11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply These to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning:** Recognize the need for and have the preparation and ability to Engage in in dependent and life-long learning in the broadest context of technological change.

MA3351 TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS

L T P C

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UNIT I PARTIAL DIFFERENTIAL EQUATIONS 9+3

Formation of partial differential equations –Solutions of standard types of first order partial differential equations - First order partial differential equations reducible to standard types- Lagrange's linear equation - Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

UNIT II FOURIER SERIES 9+3

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series and cosine series – Root mean square value – Parseval's identity – Harmonic analysis.

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 9+3

Classification of PDE – Method of separation of variables - Fourier series solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two-dimensional equation of heat conduction (Cartesian coordinates only).

UNIT IV FOURIER TRANSFORMS 9+3

Statement of Fourier integral theorem– Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

UNIT V Z - TRANSFORMS AND DIFFERENCE EQUATIONS 9+3

Z-transforms - Elementary properties – Convergence of Z-transforms - Initial and final value theorems - Inverse Z-transform using partial fraction and convolution theorem - Formation of difference equations – Solution of difference equations using Z - transforms.

TOTAL: 60 PERIODS

COURSE OUTCOMES (COs)

On completion of this course, the students expected to be able to:	
CO1	Understand how to solve the given standard partial differential equations.
CO2	Solve differential equations using Fourier series analysis which plays a vital role in engineering applications.
CO3	Appreciate the physical significance of Fourier series techniques in solving one- and two dimensional heat flow problems and one-dimensional wave equations.
CO4	Understand the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.
CO5	Use the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time systems

CO's – PO's & PSO's MAPPING

Correlation of COs with POs / PSOs															
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	1	1	-	-	-	-	2	-	-	3	-	-	-
CO2	3	3	1	1	-	-	-	-	2	-	-	3	-	-	-
CO3	3	3	1	1	-	-	-	-	2	-	-	3	-	-	-
CO4	3	3	1	1	-	-	-	-	2	-	-	3	-	-	-
CO5	3	3	1	1	-	-	-	-	2	-	-	3	-	-	-
Avg.	3	3	1	1	-	-	-	-	2	-	-	3	-	-	-
3 – High 2 – Medium 1 - Low															

TEXT BOOKS

1. Grewal B.S., “Higher Engineering Mathematics", 44thEdition, Khanna Publishers, New Delhi, 2018.
2. Kreyszig E, "Advanced Engineering Mathematics ", 10th Edition, John Wiley, New Delhi, India,
3. Narayanan. S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for II & III, S.Viswanathan Publishers Pvt. Ltd, Chennai, 1998.

REFERENCE BOOKS

1. Andrews. L.C and Shivamoggi. B, "Integral Transforms for Engineers" SPIE Press, 1999.
2. Bali. N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 10th Edition, Laxmi Publications Pvt. Ltd, 2021.
3. James. G., "Advanced Modern Engineering Mathematics", 4thEdition, Pearson Education, NewDelhi, 2016.
4. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2018.
5. Wylie. R.C. and Barrett. L.C., “Advanced Engineering Mathematics “Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012

UNIT– I
PARTIAL DIFFERENTIAL EQUATIONS

PART–A				
Q. No	**Questions**	**CO Mapping**	**BT Level**	**Complexity**
1	If u=$x^2+t^2$is a solution of $c^2\frac{\partial^2 u}{\partial x^2}=\frac{\partial^2 u}{\partial t^2}$, then find the value of c?	CO1	Create	High
2	Solve $(D^2-6DD'+9D'^2)$Z=0	CO1	Create	High
3	Find the complete integral of the PDE $z=px+qy+\sqrt{pq}$	CO1	Create	High
4	Solve $(D^3-3DD'^2+2D'^3)$Z=0	CO1	Create	High
5	Find the partial differential equation by eliminating the arbitrary function 'f' from the relation $z=f(x^2-y^2)$	CO1	Create	High
6	Find a PDE by eliminating the arbitrary constants a and b form $z=(x+a)^2+(y-b)^2$	CO1	Create	High
7	Find the partial differential equation by eliminating the arbitrary function 'f' from the relation $z=f(x^3-y^3)$	CO1	Create	High
8	Find the complete integral of the PDE $z=px+qy+\sqrt{p^3+q^3}$	CO1	Create	High
9	Solve $(D^3-7DD'^2-6D'^{3s})$Z=0	CO1	Create	High
10	Find the particular integrals $\frac{\partial^2 z}{\partial x^2}-4\frac{\partial^2 z}{\partial x\partial y}+4\frac{\partial^2 z}{\partial y^2}=e^{2x+y}$	CO1	Create	High

PART–B				
Q. No	**Questions**	**CO Mapping**	**BT Level**	**Complexity**
1	Solve $\frac{\partial^3 z}{\partial x^3} - 2\frac{\partial^3 z}{\partial x^2 \partial y} = 2e^{2x} + 3x^2 y$.	CO1	Create	High
2	Solve x(y-z)p+y(z-x)q=z(x-y) where p=$\frac{\partial z}{\partial x}$, q=$\frac{\partial z}{\partial y}$.	CO1	Create	High
3	Solve $(D^3 - 2D^2D')$Z=sin(x+2y)+$3x^2y$	CO1	Create	High
4	Solve x^2(y-z)p+y^2(z-x)q=z^2(x-y) .	CO1	Create	High
5	Find the general solution of $(D^2 + 2DD' + D'^2)$Z=$x^2y + e^{x-y}$.	CO1	Create	High
6	Solve x($z^2 - y^2$)p+y($x^2 - z^2$)q=z($y^2 - x^2$) .	CO1	Create	High
7	Solve (x-2z)p+(2z-y)q=y-x	CO1	Create	High
8	Solve $z = px + qy + \sqrt{1 + p^2 + q^2}$	CO1	Create	High
9	Solve $(D^2 - 5DD' + 6D'^2)$Z=$ysinx$.	CO1	Create	High
10	Solve $z = px + qy + p^2 + pq + q^2$.	CO1	Create	High
11	Solve $(D^2 + DD' - 6D'^2)$Z=$ycosx$.	CO1	Create	High
12	Solve $z = px + qy + p^2 - q^2$	CO1	Create	High
13	Solve $\frac{\partial^2 z}{\partial x^2} + 2\frac{\partial^2 z}{\partial x \partial y} + \frac{\partial^2 z}{\partial y^2} = \cos(2x - 4y) + e^{x+y}$	CO1	Create	High

UNIT – II

FOURIER SERIES

PART–A				
Q. No	**Questions**	**CO Mapping**	**BT Level**	**Complexity**
1	Find the coefficient $b_n$of the Fourier series for $f(x) = x^2$, in (-2,2)	CO2	Create	High
2	Find the coefficient $b_n$of the Fourier series for $f(x) = x$, in (0,2)	CO2	Create	High
3	State the Dirichlet's conditions.	CO2	Remember	Low
4	Write the formula of half range cosine series in the interval(0,l)	CO2	Understand	Low
5	State Parseval's identity in Fourier series.	CO2	Remember	Low
6	State the condition for a function $f(x)$ to be expressed as a Fourier series.	CO2	Remember	Low
7	Find the coefficient $a_n$of the Fourier series for $f(x) = x$, in (0,2)	CO2	Create	High
8	Write the formula of half range sine series in the interval(0,l)	CO2	Understand	Low
9	Write the formula of half range cosine series in the interval(0,π)	CO2	Understand	Low
10	Find the coefficient $a_0$of the Fourier series for $f(x) = e^x$, in (0,π)	CO2	Create	High

<table>
<tr><th colspan="5">PART–B</th></tr>
<tr><th>Q.No</th><th>Questions</th><th>CO Mapping</th><th>BT Level</th><th>Complexity</th></tr>
<tr><td>1</td><td>Compute the first two harmonics of the Fourier series of f(x) given by the following table.
<table>
<tr><td>x</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr>
<tr><td>y</td><td>4</td><td>8</td><td>15</td><td>7</td><td>6</td><td>2</td></tr>
</table></td><td>CO2</td><td>Create</td><td>High</td></tr>
<tr><td>2</td><td>Compute the first two harmonics of the Fourier series of f(x) given by the following table.
<table>
<tr><td>x</td><td>0</td><td>$\frac{T}{6}$</td><td>$\frac{T}{3}$</td><td>$\frac{T}{2}$</td><td>$\frac{2T}{3}$</td><td>$\frac{5T}{6}$</td></tr>
<tr><td>y</td><td>1.98</td><td>1.3</td><td>1.06</td><td>1.3</td><td>-0.88</td><td>-0.5</td></tr>
</table></td><td>CO2</td><td>Create</td><td>High</td></tr>
<tr><td>3</td><td>Compute the first two harmonics of the Fourier series of f(x) given by the following table.
<table>
<tr><td>x</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr>
<tr><td>y</td><td>9</td><td>18</td><td>24</td><td>28</td><td>26</td><td>20</td></tr>
</table></td><td>CO2</td><td>Create</td><td>High</td></tr>
<tr><td>4</td><td>Compute the first two harmonics of the Fourier series of f(x) given by the following table.
<table>
<tr><td>x</td><td>0</td><td>$\frac{\pi}{3}$</td><td>$\frac{2\pi}{3}$</td><td>π</td><td>$\frac{4\pi}{3}$</td><td>$\frac{5\pi}{3}$</td><td>2π</td></tr>
<tr><td>y</td><td>1</td><td>1.4</td><td>1.9</td><td>1.7</td><td>1.5</td><td>1.2</td><td>1</td></tr>
</table></td><td>CO2</td><td>Create</td><td>High</td></tr>
<tr><td>5</td><td>Find the Fourier series for $f(x) = x^2$ in $-\pi \le x \le \pi$. Hence deduce that $\frac{1}{1^2}+\frac{1}{2^2}+\frac{1}{3^2}+\cdots\infty = \frac{\pi^2}{6}$</td><td>CO2</td><td>Create</td><td>High</td></tr>
<tr><td>6</td><td>Find the Fourier series expansion of $f(x) = x(2\pi - x)$ in $(0,2\pi)$</td><td>CO2</td><td>Create</td><td>High</td></tr>
<tr><td>7</td><td>Find the Fourier series expansion of $f(x) = sinax$ in $(-l, l)$</td><td>CO2</td><td>Create</td><td>High</td></tr>
<tr><td>8</td><td>Find the half range cosine series for $f(x) = (x-1)^2$ in $0 \le x \le 1$.</td><td>CO2</td><td>Create</td><td>High</td></tr>
<tr><td>9</td><td>Compute the first two harmonics of the Fourier series of f(x) given by the following table.
<table>
<tr><td>x</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr>
<tr><td>y</td><td>5</td><td>9</td><td>16</td><td>8</td><td>7</td><td>3</td></tr>
</table></td><td>CO2</td><td>Create</td><td>High</td></tr>
</table>

<table>
<tr><td>10</td><td>Compute the first two harmonics of the Fourier series of f(x) given by the following table.<table><tr><td>x</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr><tr><td>y</td><td>10</td><td>19</td><td>25</td><td>29</td><td>27</td><td>21</td></tr></table></td><td>CO2</td><td>Create</td><td>High</td></tr>
<tr><td>11</td><td>Compute the first two harmonics of the Fourier series of f(x) given by the following table.<table><tr><td>x</td><td>0</td><td>$\frac{\pi}{3}$</td><td>$\frac{2\pi}{3}$</td><td>π</td><td>$\frac{4\pi}{3}$</td><td>$\frac{5\pi}{3}$</td><td>2π</td></tr><tr><td>y</td><td>10</td><td>12</td><td>15</td><td>20</td><td>17</td><td>11</td><td>10</td></tr></table></td><td>CO2</td><td>Create</td><td>High</td></tr>
<tr><td>12</td><td>Find the Fourier series for $f(x) = x$ in $-\pi \leq x \leq \pi$.</td><td>CO2</td><td>Create</td><td>High</td></tr>
<tr><td>13</td><td>Find the Fourier series expansion of $f(x) = x^2$in $(0,2\pi)$</td><td>CO2</td><td>Create</td><td>High</td></tr>
<tr><td>14</td><td>Obtain the Fourier series expansion of $f(x) = x(10 - x)$ in $(0,10)$.Hence find the sum of the series $\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \cdots$</td><td>CO2</td><td>Create</td><td>High</td></tr>
</table>

UNIT – III
APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS

PART–A				
Q. No	**Questions**	**CO Mapping**	**BT Level**	**Complexity**
1	Classify PDE $u_{xx} - x^2 u_{yy} = 0$.	CO3	Analyze	Medium
2	Write the condition of two-dimensional heat equation along y-direction.	CO3	Understand	Low
3	Classify the partial differential equation $\frac{\partial^2 f}{\partial x^2} + 2\frac{\partial^2 f}{\partial x \partial y} + 4\frac{\partial^2 f}{\partial x^2} = 0$	CO3	Analyze	Medium
4	Write the condition of two-dimensional heat equation along X-direction.	CO3	Understand	Low
5	Write down the appropriate solution of the one dimensional heat flow equation. How is it chosen?	CO3	Understand	Low
6	The ends A and B of a rod 30cm long, have their temperature kept 10^0C and 100^0C. Then obtain the steady state temperature.	CO3	Create	High
7	The ends A and B of a rod 100cmlong, have their temperature kept 10^0C and 100^0C. Then obtain the steady state temperature.	CO3	Create	High
8	Classify PDE $u_{xx} - y^2 u_{yy} = 2y^{3} u_{yy}$	CO3	Analyze	Medium
9	Write down the various solutions of one dimensional wave equation.	CO3	Understand	Low

PART–B				
Q. No	**Questions**	**CO Mapping**	**BT Level**	**Complexity**
1	A string is stretched and fastened to two points at a distance 'l' apart motion is started by displacing the string in the form $y = k(lx - x^2)$ form which it is released at a time t=0.Find the displacement at any point on the string at a distance x from one end at time t.	CO3	Create	High
2	A tightly stretched string with fixed end points x=0 and x=l is initially at rest in its equilibrium position. If it is set vibrating by giving each of its points a velocity $\lambda x(l - x)$, find y(x,t).	CO3	Create	High
3	A rectangular plate with insulated surfaces is 10cm wide and so long compared to its width that it may be considered infinite in length without introducing an appreciable error. If the temperature along the short edge $y = 0$ is given by $u(x, 0) = 20x, 0 \le x \le 5$ $u(x, 0) = 20(10 - x), 5 \le x \le 10$ While the two long edges $x = 0$ and $x = 10$ as well as the other short edge are kept at$0^{\circ}C$.Find the temperature function $u(x, y)$ in steady state at any point of the plate.	CO3	Create	High
4	A string is tightly stretched and its ends are fastened at two points $x = 0$ and $x = 2l$. The mid-point of the string is displaced transversely through a small distance b and the string is released form rest in that position. Obtain an expression for the displacement of the string at any subsequent time.	CO3	Create	High
5	The ends A and B of a rod 30cm long, have their temperature kept 20^0C and 80^0C. respectively until steady state condition prevail. The temperature at each end is then suddenly reached to 60^0C and that of A is raised 40^0C. Find the temperature distribution in the rod after time t.	CO3	Create	High

6	A tightly stretched string of length 2l is fastened at both ends. The midpoint of the string is displaced by distance 'b' transversely and the string is released from rest in this position. Find the displacement y at any distance x from one end at any time t.	CO3	Create	High
7	An infinitely long metal plate in the from of an area is enclosed between the lines $y = 0$ and $y = \pi$ for positive values of x. The temperature is zero along the edges $y = 0$ and $y = \pi$ and the edge at infinity. If the edge $x = 0$ is kept the temperature 'ky' , find the steady state temperature at any point in the plate.	CO3	Create	High

UNIT – IV

FOURIER TRANSFOMS

PART–A				
Q. No	**Questions**	**CO Mapping**	**BT Level**	**Complexity**
1	State the convolution theorem for Fourier transform.	CO4	Remember	Low
2	State the Parseval's identity for Fourier transform.	CO4	Remember	Low
3	Find the Fourier cosine transform of $4e^{-2x}$	CO4	Create	High
4	Find $F_s[7e^{-3x}]$	CO4	Create	High
5	Find the Fourier sine transform of $f(x) = e^{-ax}$	CO4	Create	High
6	Find the Fourier sine transform of $3e^{-5x}$	CO4	Create	High
7	Find $F_c[5e^{-2x}]$	CO4	Create	High
8	Write the formula of inverse Fourier transform.	CO4	Understand	Low
9	What are the sufficient conditions for the existence of Fourier transform of a function $f(x)$?	CO4	Understand	Low
10	State the modulation property in Fourier transforms.	CO4	Remember	Low

PART–B				
Q. No	**Questions**	**CO Mapping**	**BT Level**	**Complexity**
1	Find the Fourier transform of $f(x)=\begin{cases}1-\lvert x\rvert, & \lvert x\rvert<1\\ 0, & \lvert x\rvert>1\end{cases}$ Hence deduce that $\int_0^\infty \left(\frac{\sin t}{t}\right)^2 dt=\frac{\pi}{2}$, $\int_0^\infty \left(\frac{\sin t}{t}\right)^4 dt=\frac{\pi}{3}$	CO4	Create	High
2	Evaluate $\int_0^\infty \frac{dx}{(s^2+a^2)(s^2+b^2)}$ using transforms.	CO4	Apply	Medium
3	Using Parseval's identity, evaluate $\int_0^\infty \frac{x^2dx}{(x^2+a^2)^2}$, $a>0$.	CO4	Apply	Medium
4	Using Parseval's identity, evaluate $\int_0^\infty \frac{dx}{(x^2+a^2)^2}$, $a>0$.	CO4	Apply	Medium
5	Evaluate $\int_0^\infty \frac{\lambda^2 d\lambda}{(\lambda^2+a^2)(\lambda^2+b^2)}$ using transforms.	CO4	Apply	Medium
6	Find the Fourier transform of $f(x)=\begin{cases}x, & \lvert x\rvert<a\\ 0, & \lvert x\rvert>a\end{cases}$	CO4	Create	High
7	Find the Fourier sine transform of $f(x)=\begin{cases}x, & 0<x<1\\ 2-x, & 1<x<2\\ 0, & x>2\end{cases}$	CO4	Create	High
8	Find the Fourier transform of $f(x)=\begin{cases}1-x^2, & \lvert x\rvert<1\\ 0, & \lvert x\rvert>1\end{cases}$	CO4	Create	High
9	Find the Fourier transforms of $e^{-\frac{x^2}{2}}$	CO4	Create	High
10	State and prove that convolution theorem of Fourier transform.	CO4	Create	High
11	Find the Fourier cosine and sine transforms of $e^{-ax}, a>0$.	CO4	Create	High
12	Find the Fourier transform of $e^{-a^2x^2}$, $a>0$. Hence show that $e^{-\frac{x^2}{2}}$ is self-reciprocal under Fourier transform.	CO4	Create	High

13	Show that the Fourier transform of f(x)=$\begin{cases} a^2 - x^2 , & \|x\| < a \\ 0 , & \|x\| > a > 0 \end{cases}$ is $2\sqrt{\frac{2}{\pi}}\left(\frac{sin\ as - ascosas}{s^3}\right)$ and Hence deduce that(i) $\int_0^\infty \frac{\sin t - tcos\ t}{t^3} dt = \frac{\pi}{4}$. (ii) $\int_0^\infty \left(\frac{\sin t - tcos\ t}{t^3}\right)^2 dt = \frac{\pi}{15}$	CO4	Create	High

UNIT – V
Z - TRANSFORMS AND DIFFERENCE EQUATIONS

PART–A				
Q. No	**Questions**	**CO Mapping**	**BT Level**	**Complexity**
1	State the final value theorem for Z-transform.	CO5	Remember	Low
2	State the convolution theorem for Z-transform.	CO5	Remember	Low
3	Find $Z\{a^n\}$	CO5	Create	High
4	State the initial value theorem for Z-transform.	CO5	Remember	Low
5	Find $Z\left\{\frac{1}{n!}\right\}$	CO5	Create	High
6	Find Z-transform of unit impulse sequence $\delta(n) = \begin{cases} 1 & , n = 0 \\ 0 & , n \neq 0 \end{cases}$	CO5	Create	High
7	Find Z-transform of unit step sequence $U(n) = \begin{cases} 1 & , n \geq 0 \\ 0 & , n < 0 \end{cases}$	CO5	Create	High
8	Does the Z-transform of a^n exist? Justify your answer.	CO5	Analyze	Medium
9	Find $Z\{n(n-1)\}$	CO5	Create	High
10	Find Z-transform of 1.	CO5	Create	High

PART–B				
Q. No	**Questions**	**CO Mapping**	**BT Level**	**Complexity**
1	Solve the difference equation $y_{n+2} + 4y_{n+1} + 3y_n = 3^n$ given that $y_0 = 0, y_1 = 1$ using Z-transform.	CO5	Create	High
2	Solve the difference equation $u_{n+2} - 5u_{n+1} + 6u_n = 4^n$ given that $u_0 = 0, u_1 = 1$ using Z-transform.	CO5	Create	High
3	Using the Z-transform, solve y(K+2)-4y(K+1)+4y(K)=0 with y(0)=1,y(1)=0.	CO5	Apply	Medium
4	State and prove that convolution theorem of Z-transform.	CO5	Create	High
5	Find the inverse Z-transform of $\frac{z^2}{(z-a)(z-b)}$ using convolution theorem.	CO5	Create	High
6	Find $Z^{-1}\left[\frac{z^2}{(z-1)(z-3)}\right]$	CO5	Create	High
7	Find the inverse Z-transform of $\frac{z^2}{\left(z-\frac{1}{2}\right)\left(z+\frac{1}{4}\right)}$ using convolution theorem.	CO5	Create	High
8	Find the Z-transforms of {n} and $\left\{\frac{1}{n+1}\right\}$.	CO5	Create	High
9	Solve the difference equation $y_{n+2} - 7y_{n+1} + 12y_n = 2^n$ given that $y_0 = y_1 = 0$ using Z-transform.	CO5	Create	High
10	Using the Z-transform, solve (i) $y_{n+2} + 6y_{n+1} + 9y_n = 2^n$ with $y_0 = y_1 = 0$	CO5	Apply	Medium
11	State and prove final value theorem of Z-transform.	CO5	Create	High

12	Find the inverse Z-transform of $\frac{8z^2}{(2z-1)(4z-1)}$ using convolution theorem.	CO5	Create	High
13	Find the Z-transforms of $\frac{2n+3}{(n+1)(n+2)}$	CO5	Create	High
14	Find the inverse Z-transform of $\frac{z(z^2-z+2)}{(z+1)(z-1)^2}$	CO5	Create	High
15	Find the inverse Z-transform of $\frac{z^2}{\left(z-\frac{1}{2}\right)\left(z-\frac{1}{4}\right)}$ using convolution theorem.	CO5	Create	High
16	Find $Z\{a^n \sin n\theta\}$ and hence find $Z\{r^n \sin n\theta\}$.	CO5	Create	High

THANK YOU

ALL THE BEST