Q. Code:793627

Reg. No. | | | | | | | | | | | | | |

B.E. / B.TECH. DEGREE EXAMINATIONS, MAY 2024

Third Semester

MA22354 – MATHEMATICS FOR ELECTRICAL ENGINEERS

(Electrical and Electronics Engineering)

(Regulation 2022)

TIME: 3 HOURS **MAX. MARKS: 100**

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	Express proficiency in handling higher order Partial differential equations.	**3**
CO 2	Acquire the skill in examining a signal in another domain rather in the original domain by handling Full and Half Range Fourier Series.	**3**
CO 3	Develop skills in classification, formulation, solution, and interpretation of PDE models.	**3**
CO 4	Develop the skill of conversion between time domain to frequency domain using the concept of Fourier Transforms.	**3**
CO 5	Apply the systematic method for finding the impulse response of LTI systems described by difference equations: partial fraction expansion.	**3**

PART- A (20 x 2 = 40 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	Obtain the partial differential equation by eliminating arbitrary constants a and b from $z=(x-a)^2+(y-b)^2+1$.	**1**	**2**
2.	Solve $(1-x)p+(2-y)q=3-z$.	**1**	**3**
3.	Find the partial differential equation of all planes having equal intercepts on the x and y axis.	**1**	**3**
4.	Find the Particular Integral of $\frac{\partial^2 z}{\partial x^2}+2\frac{\partial^2 z}{\partial x \partial y}+\frac{\partial^2 z}{\partial y^2}=2\cos y$.	**1**	**2**
5.	If $f(x)=x^2+x$ is expressed as a Fourier series in the interval $(-2,2)$, what is the value of *f(x)* at x = 2?	**2**	**2**
6.	Find the root mean square value of $f(x)=x^2$ in $(0,\pi)$.	**2**	**2**
7.	What is the constant term a_0 and the coefficient a_n of $\cos nx$ in the Fourier series expansion of $f(x)=x-x^3$ in $(-\pi,\pi)$?	**2**	**3**
8.	Find the Fourier sine series for the function $f(x)=1, 0<x<\pi$	**2**	**2**

9.	The ends A and B of a rod of length 10 cm long have their temperature kept at $20^{\circ}c$ and $70^{\circ}c$.Find the steady state temperature distribution on the rod.	**3**		**2**
10.	Classify the PDE: $u_{xx}+2u_{yy}+3u_{xy}=0$.	**3**		**2**
11.	A tightly stretched string of length *l*is fastened at both ends. The mid point of the string is displaced to a distance 'h' and released from rest in this position write the initial conditions.	**3**		**3**
12.	How many boundary conditions are required to solve the two dimensional heat equation in the steady state?	**3**		**3**
13.	Find the Fourier sine transform of $f(x)=\frac{1}{x}$.	**4**		**2**
14.	Find the Fourier transform of $f(x)=\begin{cases} e^{ikx}, a<x<b \\ 0, x<a \wedge x>b \end{cases}$	**4**		**2**
15.	If *f(x)* is even function of *x* then prove that $F(s)=F[f(x)]$ is also an even function of *s*.	**4**		**2**
16.	Find the Fourier cosine transform of xe^{-2x}.	**4**		**2**
17.	Find the Z transform of a^n.	**5**		**2**
18.	Find the Z transform of the sequence $f(0)=1, f(1)=-1, f(2)=2, f(3)=-2, f(4)=4, \ldots$	**5**		**2**
19.	Find the inverse Z transform of $\frac{z}{(z-1)(z-2)}$	**5**		**2**
20.	Form the difference equation from $y_n=a+b3^n$.	**5**		**2**

PART- B (5 x 10 = 50 Marks)

		Marks	CO	RBT LEVEL
21. (a)	Find the singular solution of $z=px+qy+\frac{p}{q}-p$.	**(10)**	**1**	**3**
	(OR)			
(b)	Solve $(D^2-2DD'+2D'^2)z=\sin(x¿-y).¿$	**(10)**	**1**	**3**
22. (a)	Find the Fourier series of $f(x)=x(2\pi-x)$ in $0\le x\le 2\pi$. Find the sum of the	**(10)**	**2**	**3**

series $\frac{1}{1^2}+\frac{1}{2^2}+\frac{1}{3^2}+\ldots$

(OR)

(b)	Find the Fourier sine series of $f(x)=\begin{cases}\frac{1}{4}-x, 0<x<\frac{1}{2}\\ x-\frac{3}{4}, \frac{1}{2}<x<1\end{cases}$	**(10)**	**2**	**3**
23. (a)	An elastic string is stretched between two fixed points a distance π apart. In its initial position the string is in the shape of the curve $f(x)=kx$ and then release it from rest. Obtain the displacement $y(x,t)$.	**(10)**	**3**	**3**

(OR)

(b)	A rectangular plate is bounded by the lines $x=0, x=a, y=0, y=b$ and the edge temperatures are $u(0,y)=0, u(x,b)=0, u(a,y)=0, u(x,0)=5\sin\frac{5\pi x}{a}+3\sin\frac{3\pi x}{a}$. Find the steady state temperature distribution at any point of the plate.	**(10)**	**3**	**3**
24. (a)	Find Fourier transform of $f(x)=\begin{cases}a^2-x^2, & \lvert x\rvert\le a\\ 0, & \lvert x\rvert>a\end{cases}$.	**(10)**	**4**	**3**

(OR)

(b)	Find the Fourier sine transforms of $f(x)=\begin{cases}x, & \text{for } 0<x<1\\ 2-x, & \text{for } 1<x<2\\ 0, & \text{for } x>2\end{cases}$	**(10)**	**4**	**3**
25. (a)	Using Convolution theorem find inverse Z-transform of $\frac{z^2}{(z-1)^2}$	**(10)**	**5**	**3**

(OR)

(b)	Solve using Z-transform $u_{n+2}+6u_{n+1}+9u_n=2^n$ with $u_0=u_1=0$	**(10)**	**5**	**3**

PART- C (1 x 10 = 10 Marks)

(Q.No.26 is compulsory)

		Marks	CO	RBT LEVEL
26.	Find the Fourier cosine series of $f(x)=x(\pi-x)$ in $0<x<\pi$. Deduce that $\frac{1}{1^4}+\frac{1}{2^4}+\frac{1}{3^4}+\ldots=\frac{\pi^4}{90}$.	**(10)**	**2**	**3**

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