QUESTION BANK

Course Name	:	**MATHEMATICS-IV**
Course Code	:	
Class	:	II - B. Tech I Sem
Branch	:	ECE, CIVIL,MECH,CSE
Year	:	2017 – 2018
Course Faculty	:	Mr. V.Niranjan, Mr. A. Ajay Babu, Ms.P.VIjaya laxmi

OBJECTIVES

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education. The major emphasis of accreditation process is to measure the outcomes of the program that is being accredited.

In line with this, Faculty of Institute of Aeronautical Engineering, Hyderabad has taken a lead in incorporating philosophy of outcome based education in the process of problem solving and career development. So, all students of the institute should understand the depth and approach of course to be taught through this question bank, which will enhance learner's learning process.

1. Group - A (Short Answer Questions)

S. No	Question	Blooms Taxonomy Level	Course outcomes
	UNIT-I **FUNCTIONS OF COMPLEX VARIABLE**		
1	Define Analytic function with one example.	Analyse	d
2	Write the necessary and sufficient condition for f(z) to be analytic in Cartesian coordinates.	Analyse	c
3	Find where the function f(z)= $\frac{z+2}{z(z^2+1)}$ ceases(fails) to be analytic.	Evaluate	d
4	Show that the real and imaginary parts of an analytic function are harmonic.	Analyse	a
5	Prove that Z^n is analytic where n is positive integer.	Understand	d
6	Show that the function $U = 2\log(x^2 + y^2)$ is harmonic.	Understand	c
7	Define harmonic function.	Evaluate	d
8	Define Complex potential function.	Analyse	d
9	If w=logz, find $\frac{dw}{dz}$ and determine where W is non-analytic.	Understand	a

S. No	Question	Blooms Taxonomy Level	Course outcomes
10	Find k such that $f(x,y)=x^3+3kxy^2$ be harmonic.	Understand	d
11	Find whether $f(z)=\sin x\sin y-i\cos x\cos y$ is analytic or not.	Analyse	d
12	Find whether $f(z)=\dfrac{x-iy}{x+iy}$ is analytic or not.	Analyse	d
13	Prove that the function $f(z)=\bar{z}$ is not analytic at any point.	Understand	c
14	Prove that z^n (n is a positive integer) is analytic and hence find derivative.	Analyse	b
15	Find all values of k, such that $f(z)=e^x(\cos ky+i\sin ky)$ is analytic.	Analyse	d
16	Define Analytic Function & Harmonic function.	Remember	a
17	Derive Polar form of Cauchy Riemann Equations.	Analyse	d
18	Prove that every differentiable function is continuous.	Evaluate	c
19	Show that $f(z)=z+2\bar{z}$ is not analytic anywhere in the complex plane.	Analyse	d
20	If $w=u+iv=z^3$ prove that $u=c_1$ and $v=c_2$ where c_1 and c_2 are constant, cut each other orthogonally.	Understand	d
21	Show that (i) $f(z)=e^z$ (ii) $f(z)=e^{\bar{z}}$ is analytic everywhere in the complex plane and find $f'(z)$.	Remember	d
22	Explain the procedure of Milne-Thomson method.	Remember	a
23	Define functions of complex variable.	Remember	a
24	Define Entire function.	Remember	a
25	Define Differentiability of a complex function.	Remember	a
26	Define Continuity of a complex function.	Remember	a
27	Define Limit of a complex function.	Understand	a
	UNIT-II **COMPLEX INTEGRATION**		
1	State Cauchy’s integral formula	Remember	a

S. No	Question	Blooms Taxonomy Level	Course outcomes
2	State Cauchy's theorem	Remember	a
3	Define Isolated Singular point	Remember	C
4	Define Essential Singular point	Remember	C
5	State Taylor's theorem	Remember	C
6	State Laurent's theorem	Remember	C
7	Define Removable Singular Point	Remember	C
8	Define Zero of ananlytic function	Remember	C
9	State Cauchy's Residue theorem	Remember	C
10	Write the formula for Residue of f(z) at Simple Pole Z=a and Pole of order m.	Create	C
11	Define pole and simple pole	Remember	C
12	Expand $\frac{1}{z-1}$ when $\|z\|>1$	Create	C
13	Expand e^z as Taylor's series about z=1	Create	C
14	Expand $\frac{1}{z+1}$ when $\|z\|>1$	Create	C
15	Find the Residue of f(z)= $\frac{1+e^z}{\sin z+\cos z}$ at z=0.	Analyse	C
16	Find the Residue of f(z)= $\frac{e^{iz}}{z^2+1}$ at z=i.	Analyse	C
17	Find the poles of f(z)= $\frac{1}{\cosh z}$	Analyse	C
18	Find the Residue of f(z)= $\frac{1}{z\sin z}$ at z=0.	Analyse	C
19	Find the Residue of f(z)= $\frac{1}{z-\sin z}$ at z=0.	Analyse	C
20	Find the poles of $\frac{z^3-1}{z^3+1}$	Analyse	C
21	Find the Taylor's series expansion of $\frac{1}{(z-1)(z-2)}$	Analyse	D
22	Find the poles of Tanhz	Analyse	d

S. No	Question	Blooms Taxonomy Level	Course outcomes
23	Obtain the Taylor's series to represent the function $e^{(1+z)}$ in powers of $z-1$.	Analyse	d
24	Evaluate $\int_C \frac{e^{2z}}{(z+1)^3}dz$ using Residue Theorem where c is $\lvert z \rvert = 2$.	Evaluate	b
25	Evaluate $\int_C \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)(z-2)}dz$, where C is $\lvert z \rvert = 3$. using Cauchy's integral formula.	Evaluate	b
26	State Cauchy's integral formula.	Remember	C
27	*State Cauchy's theorem*	Remember	C
28	Define Isolated Singular point	Remember	C
29	Define Essential Singular point	Remember	C
30	State Taylor's theorem.	Understand	D
31	State Laurent's theorem.	Understand	D
32	Define Removable Singular Point	Understand	D
33	Define Zero of ananlytic function	Remember	D
34	State Cauchy's Residue theorem	Understand	B
35	Write the formula for Residue of f(z) at Simple Pole Z=a and Pole of order m.	Understand	D
36	Define pole and simple pole	Remember	C
37	Expand $\frac{1}{z-1}$ when $\lvert z \rvert > 1$.	Analyse	d
37	Expand e^z as Taylor's series about z=1	Analyse	d
39	Expand $\frac{1}{z+1}$ when $\lvert z \rvert > 1$	Analyse	d
40	Find the Residue of f(z)= $\frac{1+e^z}{\sin z + \cos z}$ at z=0.	Understand	c

S. No	Question	Blooms Taxonomy Level	Course outcomes
41	Find the Residue of f(z)= $\frac{e^{iz}}{z^2+1}$ at z=i.	Understand	C
42	Find the poles of f(z)= $\frac{1}{\cosh z}$.	Understand	C
43	Find the Residue of f(z)= $\frac{1}{z\sin z}$ at z=0.	Understand	C
44	Find the Residue of f(z)= $\frac{1}{z-\sin z}$ at z=0.	Understand	C
45	Find the poles of $\frac{z^3-1}{z^3+1}$	Understand	C
UNIT-III **EVALUATION OF INTEGRALS**			
1	Find the invariant points of the transformation $w=\frac{z-1}{z+1}$.	Understand	d
2	Find the critical points of w= z^2.	Understand	d
3	Define Conformal transformation.	Remember	d
4	Find the fixed points of $w=\frac{2z+1}{z+2}$.	Understand	d
5	Define Bilinear transformation	Remember	d
6	Write Cross ration property for bilinear transformation	Remember	d
7	Define fixed or invariant points	Remember	d
8	Discuss the standard transformation w=z^2	Understand	d
9	Explain translation	Remember	d
10.	Explain rotation or magnification	Remember	c
11	Explain inversion	Remember	c
12	Under the transformation w= $\frac{1}{z}$ find the image of the circle $\|z-2i\|=2$.	Apply	d
13	Find the image of the circle $\|z\|=2$. under the transformation w=z+3+2i	Understand	d

S. No	Question	Blooms Taxonomy Level	Course outcomes
14	Find the invariant points of the transformation $w = \frac{2i-6z}{iz-3}$.	Understand	D
15	Find the invariant points of the transformation $w = \frac{6z-9}{z}$.	Understand	D
16	Find the invariant points of the transformation $w = \frac{2z-5}{z+4}$.	Understand	D
17	Determine the bilinear transformation whose fixed points are 1,-1.	Analyze	D
18	Determine the bilinear transformation whose fixed points are i,-i.	Analyze	D
19	Show by the method of residues, $\int_0^{\pi} \frac{d\theta}{a+b\cos\theta} = \frac{\pi}{\sqrt{a^2-b^2}}, a>b>0$	Apply	B
20	Evaluate by contour integration $\int_0^{\infty} \frac{dx}{1+x^2}$.	Evaluate	B
21	Evaluate by contour integration $\int_0^{\infty} \frac{dx}{1+x^2}$.	Evaluate	B
22	Evaluate $\int_0^{\infty} \frac{1}{(x^4+a^4)} dx$.	Evaluate	b
23	Evaluate $\int_0^{2\pi} \frac{1}{(2+\cos\theta)} d\theta$.	Evaluate	b
24	Define conformal mapping and Bilinear Transformation.	Understand	D
25	Find the invariant points of the transformation $w = \frac{z-1}{z+1}$.	Understand	D
26	Define Bilinear transformation	Understand	D
27	Find the fixed points of $w = \frac{2z+1}{z+2}$.	Understand	D

S. No	Question	Blooms Taxonomy Level	Course outcomes
28	Find the fixed points of $w=\dfrac{2z+1}{z+2}$.	Understand	D
29	Write Cross ratio property for bilinear transformation	Understand	D
30	Find the invariant points of the transformation $w=\dfrac{2i-6z}{iz-3}$.	Understand	D
31	Find the invariant points of the transformation $w=\dfrac{6z-9}{z}$.	Understand	D
32	Find the invariant points of the transformation $w=\dfrac{2z-5}{z+4}$.	Understand	D
33	Determine the bilinear transformation whose fixed points are 1,-1.	Analyze	D
34	Determine the bilinear transformation whose fixed points are i,-i.	Analyze	D
35	Show that the condition for transformation $w=\dfrac{az+b}{cz+d}$ to make the circle $\|w\|=1$ Correspond to a straight line in the z-plane is $\|a\|=\|c\|$.	Analyze	D
36	Evaluate $\int_0^{2\pi}\dfrac{1}{5-3\cos\theta}d\theta$ by contour integration.	Evaluate	b

UNIT-IV

FOURIER SERIES AND FOURIER TRANSFORMS

S. No	Question	Blooms Taxonomy Level	Course outcomes
1	Find the Fourier series for the function $f(x)=\|x\|$ in $-\pi<x<\pi$ and deduce that $\dfrac{1}{1^2}+\dfrac{1}{3^2}+\dfrac{1}{5^2}+\dots\dots\dots\dots=\dfrac{\pi^2}{8}$.	Understand	D
2	If $F(p)$ is the complex Fourier transforms of $f(x)$ then $F\{f(ax)\}=\dfrac{1}{a}F\left(\dfrac{p}{a}\right), a>0$.	Analyze	D

S. No	Question	Blooms Taxonomy Level	Course outcomes
3	Expand $f(x)=\left(\frac{\pi-x}{2}\right)^2$ in $0<x<2\pi$ in a Fourier series	Remember	c
4	Expand Fourier series $f(x)=x^2-2,-2<x<2$.	Remember	c
5	obtain the half range sine Fourier series for the function $f(x)=e^x,0<x<1$.	Analyze	D
6	If $F(p)$ is the complex Fourier transforms of $f(x)$ then $F\{f(x-a)\}=e^{ipa}F(p)$.	Analyze	D
7	Expand Fourier series $f(x)=x,0<x<4$.	Remember	c
8	obtain the half range cosine Fourier series for the function $f(x)=\frac{\pi x(\pi-x)}{8},0<x<\pi$.	Analyze	D
9	obtain the half range sine Fourier series for the function $f(x)=x(\pi-x),0<x<\pi$ find $\frac{1}{1^3}-\frac{1}{3^3}+\frac{1}{5^3}-\frac{1}{7^3}+.....$	Analyze	D
10	Find Fourier $a_0$and $a_n$when f(x) =x^2 is (0, 2π)	Understand	D
11	Define a periodic function	Remember	c
12	Write the dirihlets condition for the existence of Fourier series of a function f(x) in $(\alpha,\alpha+2\pi)$	Remember	c
13	Find the Fourier series of $\pi^2-x^2\ in(-\pi,\pi)$	Understand	D
14	Define even and odd functions with 3 Examples	Remember	c
15	Find the half range sine series for f(x) = $x(\pi-x)in 0<x<\pi$	Understand	D
16	Obtain the half range sine series for e^x in $(0,\pi)$	Analyze	D
17	Find the Fourier series to represents (1-x^2) in $-1\le x\le 1$	Understand	D
18	Find the half-Range cosine series expansion of f(x) =x in [0, 2]	Understand	D
19	Express f(x) =x as a Fourier series in (-π,π)	Remember	c
20	Define Fourier Transform	Remember	c
UNIT-V			

S. No	Question	Blooms Taxonomy Level	Course outcomes
APPLICATIONS OF PDE			
S. No	**Question**	**Blooms Taxonomy Level**	**Course outcomes**
1	Explain Classification of second order partial differential equation.	Remember	c
2	Explain Method of separation of variables.	Remember	c
3	Explain one dimensional wave equation	Remember	c
4	Explain one dimensional Heat equation.	Remember	c
5	Classify the second order pde	understand	a
6	Explain method of separations of variables	Remember	c

2. Group - B (Long Answer Questions)

S. No	Question	Blooms Taxonomy Level	Course outcomes
UNIT-I FUNCTIONS OF A COMPLEX VARIABLE			
1	If $f(z)=u+iv$ is an analytic function of z and if $u-v=e^x(\cos y-\sin y)$ find $f(z)$ in terms of z.	Analyse	d
2	Find an analytic function whose real part is $\dfrac{x}{x^2+y^2}$	Analyse	a
3	Prove that the function $f(z)$ defined by $f(z)=\begin{cases}\dfrac{x^3(1+i)-y^3(1-i)}{x^2+y^2},(z\neq 0)\\ 0,(z=0)\end{cases}$ is continuous and the Cauchy – Riemann equations are satisfied at the origin, yet $f'(0)$ does not exist.	Analyse	d
4	If u is harmonic function, show that $w=u^2$ is not a harmonic function unless u is a constant.	Evaluate	A
5	Find an analytic function $f(z)$ such that real part of $f'(z)=3x^2-4y-3y^2$ and $f(1+i)=0$.	Analyse	B
6	Find the conjugate harmonic of $u=e^{x^2-y^2}\cos 2xy$. Hence find $f(z)$ in terms of z	Understand	a
7	If $f(z)$ is a regular function of z, prove that	Understand	D

S. No	Question	Blooms Taxonomy Level	Course outcomes
	$\left(\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right)\lvert f(z)\rvert^2=4\lvert f'(z)\rvert^2$		
8	If $f(z)=u+iv$ is an analytic function of z and if $u-v=e^x(\cos y-\sin y)$, find $f(z)$ in terms of z.	Understand	B
9	State and prove c-r equations in Cartesian form	Remember	c
10	State and prove c-r equations in polar form	Remember	c
11	Show that the constant modulus of analytic function is constant	Remember	c
12	Show that the real and imaginary parts of an analytic function satisfies the laplace equation	Remember	c
	UNIT-II		
1	Evaluate $\int_C \frac{\sin \pi z^2+\cos \pi z^2}{(z-1)(z-2)}dz$, where C is $\lvert z\rvert=3$. using Cauchy's integral formula.	Evaluate	A
2	Evaluate $\int_C \frac{z-1}{(z+1)^2(z-2)}dz$, where C is $\lvert z-i\rvert=3$. using Cauchy's integral formula.	Evaluate	A
3	Evaluate using Cauchy's integral formula $\int_C \frac{\cos \pi z}{(z^2-1)}dz$, around the rectangle $2\pm i, -2\pm i$.	Evaluate	B
4	Evaluate $\int_C \frac{3z^2+7z+1}{(z+1)}dz$, where C is $\lvert z+i\rvert=1$.	Evaluate	A
5	Evaluate $\int_C \frac{\log z}{(z-1)^3}dz$ where C is $\lvert z-1\rvert=\frac{1}{2}$. using Cauchy's integral formula.	Evaluate	A
6	Evaluate $\int_{1-i}^{2+i}(2x+iy+1)dz$ dz along the straight line joining (1,-i) and (2,i).	Evaluate	B
7	Evaluate $\int_C \frac{z+4}{z^2+2z+5}dz$ dz where C is $\lvert z\rvert=1$.	Evaluate	B
8	Find the Taylor's series expansion of $\frac{1}{(z-1)(z-2)}$	Understand	C
9	Evaluate $\int_C \frac{e^z}{(z^2+\pi^2)^2}$ dz where C is $\lvert z\rvert=4$.	Evaluate	B

S. No	Question	Blooms Taxonomy Level	Course outcomes
10	Evaluate $\int \lvert z\rvert dz$ where C is the contour consisting of the straight line from z=-i to z=i.	Evaluate	B
11	Evaluate $\int_C \frac{e^z}{(z+1)^2}$ dz where C is $\lvert z-1\rvert = 3$.	Evaluate	B
12	Evaluate $\int_C \frac{z^2-z+1}{(z-1)}$ dz where C is $\lvert z\rvert = \frac{1}{2}$.	Evaluate	b
13	Evaluate $\int_C \frac{z+4}{z^2+2z+5}dz$ dz where C is $\lvert z+1-i\rvert = 2$.	Evaluate	b
14	Evaluate $\int_0^{1+i} (x^2-iy)dz$ dz (i) along the straight line y=x (ii) along y=x^2	Evaluate	b
15	Evaluate $\int_C \frac{z^3-\sin 3z}{(z-\frac{\pi}{2})^3}dz$ dz where C is $\lvert z\rvert = 2$.	Evaluate	b
16	Verify Cauchy's theorem for the function f(z)=3z^2+iz-4 if C is the square with vertices at $1\pm i$ and $-1\pm i$	Analyse	d
17	Integrate f(z)= x^2+ixy from A(1,1)to B(2,8) along (i)The straight line AB (ii) The curve C:x=t,y=t^3	Analyse	d
18	Evaluate using Cauchy's integral formula $\int_C \frac{z^3e^{-z}}{(z-1)^3}dz$ where C is $\lvert z-1\rvert = \frac{1}{2}$.	Evaluate	b
19	Expand $f(z)=\frac{1}{(z-1)(z-2)}$ in the region (a) $\lvert z\rvert<1$ (b) $1<\lvert z\rvert<2$ (c) $\lvert z\rvert>2$	Analyse	d
20	Evaluate $\int_c \frac{1}{\cosh z}dz$ where C: $\lvert z\rvert=2$.	Evaluate	b
21	Find the residues of f(z)=$\frac{z^3}{(z-1)^4(z-2)(z-3)}$.	Understand	C

S. No	Question	Blooms Taxonomy Level	Course outcomes
22	Expand $\frac{z}{(z+1)(z+2)}$. about z=2.	Analyse	d
23	Expand $\frac{1}{z^2(z-3)^2}$.as Laurent's series. $\lvert z\rvert<1$ (ii) $\lvert z\rvert>3$	Analyse	d
24	Expand $\frac{1}{z(z^2-3z+2)}$.in the regions(i) $1<\lvert z\rvert<2$ (ii) $0<\lvert z\rvert<1$ (iii) $\lvert z\rvert>$**2**	Analyse	d
25	Find the Laurent series of $\frac{1}{z^2-4z+3}$ for $1<\lvert z\rvert<3$	Understand	C
26	Find the Laurent series of $\frac{Z^2-6Z-1}{(Z-1)(Z-3)(Z+2)}$ for $3<\lvert z+2\rvert<5$	Understand	C
27	Evaluate $\int_{-\infty}^{\infty}\frac{x^2-x+2}{x^4+10x^2+9}dx$ using contour integration.	Evaluate	b
28	Find the Laurent's series expansion of f(z)= $\frac{7z^2-9z-18}{z^3-9z}$ in the regions (i) $\lvert z\rvert>3$ (ii) $0<\lvert z-3\rvert<3$	Understand	C
29	Apply the calculus of residues to prove that $\int_{-\infty}^{\infty}\frac{1}{x^4+1}dx=\frac{\pi}{\sqrt{2}}$	Analyse	d
30	State and prove Residue theorem.	Remember	b
31	State and Prove Taylor's theorem.	Remember	B
32	State and Prove Laurent's theorem	Remember	B
33	Evaluate $\int_C\frac{4-3z}{z(z-1)(z-2)}dz$ where C is the Circle $\lvert z\rvert=\frac{3}{2}$ using Residue theorem.	Evaluate	b
34	Evaluate $\int_C\frac{z-3}{z^2+2z+5}dz$ where C is the Circle (i) $\lvert z+1+i\rvert=2$ (ii) $\lvert z+1-i\rvert=2$ using Residue theorem	Evaluate	b
35	Verify Cauchy's theorem for the function	Understand	a

S. No	Question	Blooms Taxonomy Level	Course outcomes
	$f(z)=3z^2+iz-4$. If c is the square with vertices at $1\pm i$ and $-1\pm i$		
36	Evaluate $\int_{(0,0)}^{(1,3)} 3x^2 y dx+(x^3-3y^2)dy$.	Evaluate	b
37	Evaluate $\oint_c \frac{z^2+4}{z-3}dz$ where c is (a) $\lvert z\rvert=5$ (b) $\lvert z\rvert=2$.	Evaluate	b
38	valuate $\oint_c \frac{e^z}{(z^2+\pi^2)^2}dz$ where c is $\lvert z\rvert=4$	Evaluate	b
39	Evaluate $\int_{(0,0)}^{(1,1)} 3x^2+4xy+ix^2)dz$ along $y=x^2$	Evaluate	b
40	Evaluate using Cauchy's theorem $\int_C \frac{z^3e^{-z}}{(z-1)^3}dz$ where C is $\lvert z-1\rvert=\frac{1}{2}$ .Evaluate $\int_C (y^2+2xy)dx+(x^2-2xy)dy$ where C is the boundary of the region by $y=x^2$ and $x=y^2$.	Evaluate	b
41	Prove that $\int_c \frac{dz}{z-a}=2\pi i$. where C is $\lvert z-a\rvert=r$.	Understand	a
42	Verify Cauchy's theorem for the integral of z^2 taken over the boundary of the rectangle with vertices $-1,1,1+i,-1+i$.	Understand	a
43	Verify Cauchy's theorem for the function $f(z)=3z^2+iz-4$ if c is the square with vertices at $1\pm i$ and $-1\pm i$.	Understand	a
44	Expand $f(z)=\frac{1}{z^2-3z+2}$ in the region (i) $0<\lvert z-1\rvert<1$.	Understand	a
45	Evaluate using Cauchy's integral formula $\int_C \frac{\sin^6 z}{(z-\frac{\pi}{2})^3}dz$.	Evaluate	b
46	Obtain the Taylor's series to represent the function	Analyse	d

S. No	Question	Blooms Taxonomy Level	Course outcomes
	$\frac{z^2-1}{(z+2)(z+3)}$ in the region $\|z\|<2$.		
47	Evaluate $\int_C \frac{\log z}{(z-1)^3}dz$ where $c:\|z-1\|=\frac{1}{2}$ using Cauchy's integral formula.	Evaluate	b
48	Find the Laurent series expansion of the function $f(z)=\frac{z^2-6z-1}{(z-1)(z-3)(z+2)}$ in the region $3<\|z+2\|<5$.	Analyse	d
49	Evaluate $\int_C \frac{z-1}{(z+1)^2(z-2)}dz$, where C is $\|z-i\|=3$. using Cauchy's integral formula.	Evaluate	b
50	Evaluate using Cauchy's integral formula $\int_C \frac{\cos \pi z}{(z^2-1)}dz$, around the rectangle $2\pm i, -2\pm i$.	Evaluate	b
51	Evaluate $\int_C \frac{3z^2+7z+1}{(z+1)}dz$, where C is $\|z+i\|=1$.	Evaluate	d
52	Evaluate $\int_{1-i}^{2+i}(2x+iy+1)dz$ dz along the straight line joining (1,-i) and (2,i).	Evaluate	D
53	Evaluate $\int_C \frac{\log z}{(z-1)^3}dz$ where C is $\|z-1\|=\frac{1}{2}$. using Cauchy's integral formula.	Evaluate	B
54	Evaluate $\int_C \frac{z+4}{z^2+2z+5}dz$ dz where C is $\|z\|=1$.	Evaluate	B
55	Evaluate $\int_C \frac{e^{2z}}{(z-1)(z-4)}dz$ where C is $\|z\|=2$.	Evaluate	B
56	Find the poles of Tanhz	Understand	C
57	Evaluate $\int_C \frac{e^{2z}}{(z-1)(z-4)}dz$ where C is $\|z\|=2$.	Evaluate	A

S. No	Question	Blooms Taxonomy Level	Course outcomes
	UNIT-III EVALUTION OF INTEGRALS		
1	Find the image of the triangular region with vertices at (0,0),(1,0),(0,1) under the transformation w= (1-i)z+3.	Analyze	C
2	Show that the condition for transformation $w=\dfrac{az+b}{cz+d}$ to make the circle $\lvert w\rvert=1$ Correspond to a straight line in the z-plane is $\lvert a\rvert=\lvert c\rvert$.	Apply	D
3	Find the bilinear transformation which maps the points $(-1,0,1)$ into the points $(0,i,3i)$.	Understand	D
4	Find and plot the image of the triangular region with vertices at $(0,0),(1,0),(0,1)$ under the transformation $w=(1-i)z+3$.	Understand	D
5	Evaluate $\int_{-\infty}^{\infty}\dfrac{x^2}{(x^2+1)(x^2+4)}dx$ by using residue theorem.	Evaluate	B
6	Find the bilinear transformation which maps the points $(2,1,-2)$ into the points $(1,1,-1)$.	Understand	D
7	Evaluate $\int_0^{2\pi}\dfrac{1}{(5-3\sin\theta)^2}d\theta$ using residue theorem.	Evaluate	B
8	Show that the function in $w=\dfrac{4}{z}$ transforms the straight line $x=c$ in the z- plane into a circle in the w-plane.	Apply	B
9	Find the bilinear transformation which maps the points $(1-2i,2+i,2+3i)$ into the points $(2+i,1+3i,4)$.	Understand	D
10	Evaluate $\int_C\dfrac{4-3z}{z(z-1)(z-2)}dz$ where C is the Circle $\lvert z\rvert=\dfrac{3}{2}$ using Residue theorem	Evaluate	B
11	Using contour integration evaluate $\int_0^{\Pi}\dfrac{a}{a^2+\sin^2\theta}d\theta$,a>0	Apply	B
12	Evaluate $\int_0^{2\pi}\dfrac{\cos 2\theta}{1-2a\cos\theta+a^2}d\theta$ using residue theorem.	Evaluate	B

S. No	Question	Blooms Taxonomy Level	Course outcomes
13	Evaluate $\int_0^{\infty} \frac{\cos ax}{x^2+1} dx$	Evaluate	B
14	Find the Bilinear Transformation which transforms the points $(\infty, i, 0)$ in the z- plane into $(0, i, \infty)$ in the w-plane.	Understand	D
15	Find the bilinear transformation which maps (-1,0,1) of the z-plane onto (-1,-i,1) of the w-plane.	Understand	D
16	Find the bilinear transformation which maps (-1,-i,-1) of the z-plane onto (i,0,-i) of the w-plane.	Understand	D
17	Find the bilinear transformation which transforms the points $(-1,0,1)$ in the z-plane into the points (0,i,3i) in the w-plane.	Understand	D
18	Find the bilinear transformation which transforms the points $(\infty, i, 0)$ in the z-plane into the points (-1,-i,1) in the w-plane.	Understand	D
19	Find the bilinear transformation which maps (1,i,-1) of the z-plane onto (2,i,-2) of the w-plane. Find the fixed and critical points of the transformation.	Understand	D
20	Find the bilinear transformation which transforms the points $(\infty, i, 0)$ in the z-plane into the points (0,i,∞) in the w-plane.	Understand	D
21	Find the fixed points of the transformation $w = \frac{2i-6z}{iz-3}$.	Understand	D
	UNIT-IV **FOURIER SERIES AND FOURIER TRANSFORMS**		
1	Find the Fourier series for the function $f(x) = \begin{cases} -k, \ for -\pi < x < 0 \\ k, \ for 0 < x < \pi \end{cases}$ hence deduce that $1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + ... = \frac{\pi}{4}$.	Understand	D
2	Find the Fourier series for the function $f(x) = x \sin x$ in $0 < x < 2\pi$.	Understand	D
3	Find the Fourier series for the function $f(x) = \begin{cases} -k, \ for -\pi < x < 0 \\ k, \ for 0 < x < \pi \end{cases}$ hence deduce that	Understand	D

S. No	Question	Blooms Taxonomy Level	Course outcomes
	$1-\frac{1}{3}+\frac{1}{5}-\frac{1}{7}+............=\frac{\pi}{4}$.		
4	Find the Fourier series for the function $f(x)=\begin{cases}-\pi; -\pi<x<0\\ x; 0<x<\pi\end{cases}$ .Hence find $\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+............$	Understand	D
5	Find the Fourier transform of $f(x)=\begin{cases}1-x^2; \lvert x\rvert\le 1\\ 0; \lvert x\rvert>1\end{cases}$ Hence evaluate (i) $\int_0^{\infty}\frac{x\cos x-\sin x}{x^3}\cos\frac{x}{2}dx$.	Apply	E
6	Find the Fourier series for f(x) =x, 0<x<2 π	Understand	D
7	Find the Fourier sine and cosine transform of $f(x)=\begin{cases}k; 0<x<a\\ 0; x>a\end{cases}$.	Understand	D
8	Find the Fourier series to F(x) = $\begin{cases}0\ for -\pi\le x\le 0\\ X^2\ for\ 0\le x\le\pi\end{cases}$	Understand	D
9	Obtain the Fourier series for the function f(x) = e^x-1 in (0, 2 π)	Analyze	D
10	Find Fourier series for f(x) =e^{-x} in (0, 2 π)	Understand	D
11	Find the Fourier series to represent the function f(x)=x sinx, $-\pi<x<\pi$ Find the Fourier series for f(x) =sin x, $-\pi<x<\pi$	Understand	D
12	Expand the function f(x) =x^3 as a Fourier series in the interval $-\pi<x<\pi$	Remember	C
13	Find the Fourier series for f(x) = x cosx, $-\pi<x<\pi$	Understand	D
14	Find Fourier b_n for f(x)=0, -π ≤x≤0 = $\frac{\pi x}{4}, 0<x<\pi$	Understand	D
15	Find a_0, b_n for f(x) =e^x from x=0 to x=2 π .	Understand	D
16	Find Fourier a_0, a_x for f(x) =0 for - $\pi<x<0$ = sinx for 0< x< π	Understand	D

S. No	Question	Blooms Taxonomy Level	Course outcomes
17	Find the Fourier series of f(x) = $\dfrac{\pi - x}{2} in\, 0 < x < 2$	Understand	D
	UNIT-V **APPLICATIONS OF PDE**		
1	Solve $\dfrac{\partial u}{\partial x} = 2\dfrac{\partial u}{\partial t} + u$ where $u(x,0) = 6e^{-3x}$.	Analyze	D
2	A string is stretched and fastened to two points at $x = 0$ and $x = l$. Motion is started by displacing the string into the form $y = k(lx - x^2)$ from which it is released at time $t = 0$. Find the displacement of any point on the string at a distance of x from the one end at time t	Apply	D
3	Solve $u_{xx} = u_y + 2u$ with $u(0, y) = 0$ and $\dfrac{\partial u(0, y)}{\partial x} = 1 + e^{-3y}$.	Analyze	D
4	Find the temperature in a bar OA of a length l which is perfectly insulated laterally and whose ends O and A are kept at $0^o C$ given that the initial temperature at any point P of the rod is given as $u(x,0) = f(x), 0 \le x \le l$.	Understand	D
5	Solve $\dfrac{\partial^2 u}{\partial x \partial t} = e^{-t} \cos x$, given that $u = 0$ when $t = 0$ and $\dfrac{\partial u}{\partial t} = 0$ when $x = 0$. Show also that as t tends to ∞, u tends to $\sin x$.	Analyze	D
6	A tightly stretched string with fixed end points $x = 0$ and $x = l$ is initially in a position given by $y = y_0 \sin^3\left(\dfrac{\pi x}{l}\right)$. If it is released from rest from this position, find the displacement $y(x,t)$.	Apply	D
7	Solve by the method of separation of variables $2xz_x - 3yz_y = 0$	Apply	D
8	Solve the one dimensional heat flow equation $\dfrac{\partial u}{\partial t} = C^2 \dfrac{\partial^2 u}{\partial x^2}$ given that $u(0,t) = 0, u(L,t) = 0, t > 0$ and $u(x,0) = 3\sin\left(\dfrac{\pi x}{L}\right), 0 < x < L$.	Understand	D
9	Using separation of variable to solve $4\dfrac{\partial u}{\partial x} + \dfrac{\partial u}{\partial y} = 3u$ with	Apply	D

S. No	Question	Blooms Taxonomy Level	Course outcomes
	$u(0,y)=3e^{-y}-e^{-5y}$.		
10	If a string of length l is initially at rest in equilibrium position and each of its points is given, the velocity $\left(\frac{\partial y}{\partial t}\right)_{t=0}=b\sin^3\left(\frac{\pi x}{l}\right)$ find the displacement y(x,t).	Apply	D
11	Solve the boundary value problem $u_{tt}=a^2u_{xx};0<x<l;t>0$ with u(0,t)=0;u(l,t)=0 and u(x,0)=0 , u_t(x,o)= $\sin^3\left(\frac{\pi x}{l}\right)$.	Apply	D
12	A square plate has its faces and the edge y=0 insulated. Its edges x=0 and x=π are kept at zero temperature and its fourth edge y= π is kept at temperature f(x). Find the steady state temperature at any point of the plate.	Apply	D
13	Solve the boundary value problem $u_{xx}+u_{yy}=0,\ for 0\le x\le\pi, 0\le y\le\pi$ which satisfies the conditions $u(0,y)=u(\pi,y)=u(x,\pi)=0$ and $u(x,0)=\sin^2 x$.	Understand	D
14	Solve the following equation by method of separation of variables $\frac{\partial^2 u}{\partial x^2}-2\frac{\partial u}{\partial x}+\frac{\partial u}{\partial y}=0.$	Understand	D
15	Solve the following equation by method of separation of variables $3\frac{\partial u}{\partial x}+2\frac{\partial u}{\partial y}=0.$ with u(x,0)=4e $^{-x}$	Understand	D
16	Solve the following equation by method of separation of variables and $u_x-4u_y=0$, u(0,y)=8e $^{-3y}$	Understand	D