SHAMBHUNATH INSTITUTE OF ENGINEERING AND TECHNOLOGY, PRAYAGRAJ

Subject Code : BAS 203 Subject :Engineering Mathematics II

Course : B.Tech. SEMESTER: II

SECOND SESSIONAL EXAMINATION, EVEN SEMESTER, (2022-2023)

Common To All

Time –2hrs Maximum Marks – 45

1. Attempt any *FIVE* questions.

Q N	QUESTION	Marks	CO	BL
a.	Examine the convergence of the sequence $\{\frac{2n+1}{n}\}$.	2	CO3	L2
b.	State necessary condition for convergent series.	2	CO3	L1
c.	Examine the convergence of the series $\sum\frac{n+1}{n}$.	2	CO3	L2
d.	Find the constant term if the function $f(x)=\pi-x$ is expanded in Fourier series defined in$(0,2\pi)$.	2	CO3	L3
e.	Find the constant term if the function $f(x)=x^2-2$ is expanded in Fourier series defined in$(-2,2)$.	2	CO3	L3
f.	Examine the convergence of the series $1+\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+\frac{1}{16}+\cdots$..	2	CO3	L2

2. Attempt any *ONE* of the following.

Q N	QUESTION	Marks	CO	BL
a.	Find half range Fourier sine series of $f(x)$ defined over the range $0<x<4$ as $f(x)=\begin{cases} x & 0<x<2 \\ 4-x & 2<x<4 \end{cases}$	5	CO3	L3
b.	Obtain a Fourier series to represent the function $f(x)=\lvert x\rvert$ and hence deduce $\frac{\pi^2}{8}=\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+\cdots$	5	CO3	L4
c.	Test the convergence of the series $\frac{x}{1.2}+\frac{x^2}{3.4}+\frac{x^3}{5.6}+\cdots$....	5	CO3	L3

. Attempt any *FIVE* questions.

Q N	QUESTION	Marks	CO	BL
a.	State necessary condition for a function to be analytic.	2	CO4	L1
b.	Show that $u=\frac{1}{2}\log(x^2+y^2)$ is harmonic.	2	CO4	L3
c.	Find the image of $x=2$ under the transformation of $w=\frac{1}{z}$	2	CO4	L2
d.	Find the fixed point under the transformation $w=\frac{2z+6}{z+7}$	2	CO4	L1
e.	Determine a,b,c,d so that the function $f(z)=(x^2+axy+by^2)+i(cx^2+dxy+y^2)$ is analytic.	2	CO4	L2
f.	Show that z^2 is analytic everywhere.	2	CO4	L3

P.T.O.

4. Attempt any *ONE* of the following.

Q N	QUESTION	Marks	CO	BL
a.	Prove that $w = \frac{z}{1-z}$ maps the upper half of the z −plane into upper half of the w −plane. What is the image of the circle $\|z\| = 1$ under this transformation?	5	CO4	L3
b.	Determine the analytic function whose real part is $e^{2x}(x\cos 2y - y\sin 2y)$.	5	CO4	L4
c.	Show that the function $f(z) = \begin{cases} \frac{x^3y^5(x+iy)}{x^6+y^{10}} & z \neq 0 \\ 0 & z = 0 \end{cases}$ is not analytic at the origin even though it satisfies Cauchy Riemann equations at origin.	5	CO4	L4

5. Attempt any *FIVE* questions.

Q N	QUESTION	Marks	CO	BL
a.	Evaluate $\int_0^{1+i} (z - \bar{z})dz$ along the line $y = 2x$	2	CO5	L2
b.	Evaluate $\oint_C \frac{e^{-z}}{z+1} dz$, where C is the circle $\|z\| = \frac{1}{2}$	2	CO5	L2
c.	Expand $\cos z$ in a Taylor's series about $z = \frac{\pi}{4}$	2	CO5	L3
d.	Find the residue of $\frac{z^2}{(z-1)(z-2)^2}$ at the pole $z = 2$	2	CO5	L2
e.	Find the residue of $z\cos\frac{1}{z}$ at $z = 0$	2	CO5	L3
f.	What is conformal transformation?	2	CO5	L1

6. Attempt any *ONE* of the following.

Q N	QUESTION	Marks	CO	BL
a.	Expand $\frac{1}{(z+1)(z+3)}$ in Taylor's or Laurent's series in the regions I. $1 < \|z\| < 3$ II. $1 < \|z+1\| < 2$	5	CO5	L3
b.	Evaluate $\oint_C \frac{z-3}{z^2+2z+5} dz$, where c is the circle $\|z + 1 - i\| = 2$	5	CO5	L3
c.	Evaluate $\int_0^{3+i} \bar{z}^2 dz$ along the real axis from $z = 0$ to $z = 3$ and then along a line parallel to imaginary axis from $z = 3$ to $z = 3 + i$.	5	CO5	L3

Bloom's Taxonomy Level (BL) :-

Remember (L1), Understanding (L2), Apply (L3), Analyze (L4), Evaluating (L5), Creating (L6)

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