Avinashilingam Institute for Home Science and Higher Education for Women
Deemed to be University Estd.u/s 3 of UGC Act 1956, Category A by MHRD
Re-accredited with 'A++' Grade by NAAC. CGPA 3.65/4, Category I by UGC
Coimbatore-641 043, Tamil Nadu, India

Continuous Internal AssessmentII- October 2024
Semester III

Class :II MSc
Branch : Mathematics

Time : 2 Hours
Max. Marks : 60

23MMAC14 - Complex Analysis

Course Outcomes:

CO1:Use Poisson formula and Mean-value property in Harmonic functions.
CO2: Expand Taylor's series and Laurent's series for a given function.
CO3: Convert various functions into canonical product form.
CO4: Identify elliptic functions.
CO5: Apply Weierstrass functions in Brownian motion.

PartA **6 x 1 =6**
Choose the Correct Answer

1. An entire function is also known as _____.**CO3K1**

a. differential function b. integral function

c. constant functiond. multi-valued function

2. The genus of sin πz is _____. **CO3K2**

a. 1 b. 5 c. 0 d. 3

3. A module with isolated points is said to be _____ **CO4K1**

a. discrete b. constant

c.nonconstant d. cyclic

4. The unimodular matrices forms _____ group **CO4K2**

a.normal b.modular c.cyclic d.abelian

5. Which of the following is Lengendre's relation? **CO5K2**

a. $\eta_1\omega_2 - \eta_2\omega_1 = 2\pi i$ b. $\eta_1\omega_2 + \eta_2\omega_1 = 2\pi i$

c. $\eta_1\omega_1 - \eta_2\omega_2 = 2\pi i$ d. $\eta_1\omega_2 - \eta_2\omega_1 = 2\pi$

6.The simple elliptic functions of order 2 have a ____. **CO5K2**

a. double pole with residue zero b. double pole with opposite residues

c. simple pole with residue zero d. simple pole with opposite residues

Part B **3 x 6 = 18**
Answer ALL questions

7.a.Prove that every function which is meromorphic in the whole plane is the quotient of two entire functions. **CO3K3**

(or)

7.b.Find the genus of $\cos\sqrt{z}$. **CO3K4**

8.a. Prove that an elliptic function without poles is a constant. **CO4K3**

(or)

8. b. Prove that any two basis of same module are connected by a unimodulartransformation. **CO4K3**

9.a.Prove that the sum of residues of an elliptic function is zero. **CO4K3**

(or)

9.b.Derive Legendre relation. **CO5K4**

Part C **3 x 12 = 36**

Answer ALL questions

10.a. State and prove Weierstrass theorem on entire function. **CO3K4**

(or)

10.b. Obtain the canonical form for $\sin \pi z$ and prove that $\sin \pi z = \pi z \prod_{n=1}^{\infty} \left(1 - \frac{z^2}{n^2}\right)$. **CO3 K3**

11.a. Prove that a discrete module consists of either of zero alone, of the integral multiples nw of a single complex number $w \neq 0$, or of all linear combinations $n_1 w_1 + n_2 w_2$ with integralcoefficients of two numbers w_1, w_2 with non-real ratio $\frac{w_2}{w_1}$. **CO4K3**

(or)

11.b. (i) Prove that a nonconstant elliptic function has equally many poles as it has zeros.

(ii) Prove that the zeros $a_1, a_2, \ldots a_n$ and poles $b_1, b_2, \ldots b_n$ of an elliptic function Satisfy $a_1+a_2+\ldots+a_n \equiv b_1+b_2+\ldots+b_n \pmod{M}$. **CO4K3**

12. a. Prove that an elliptic function which has its only singularity as a double pole with residue zero is even and is equal to the Weierstrass P function. **CO5K3**

(or)

12. b. State and prove Weierstrass P – function. **CO5K4**

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