III Semester M Sc Mathematics

ME010301 - Advanced Complex Analysis

1. If u is a harmonic function in a region D, ∂D denotes the boundary of D and $\overline{D} = D \cup \partial D$, then
   A) $\max_{\overline{D}} u \geq \max_{D} u$
   B) $\max_{\overline{D}} u = \max_{\partial D} u$
   C) $\max_{\overline{D}} u = u(x) \forall x \in D$
   D) u is a constant in D
2. The value of b for which $u(x, y) = e^{bx} cos 5y$ is harmonic
   A) 5
   B) 6
   C) 7
   D) 8
3. Solutions of Laplace's equation having continuous second order partial derivatives are called
   A) Biharmonic functions
   B) Harmonic functions
   C) Conjugate harmonic functions
   D) Error functions
4. What is the value of m for which $2x - x^2 + my^2$ is harmonic
   A) 1
   B) -1
   C) 2
   D) -2
5. If $u(x, y) = 2x^2 - 2y^2 + 4xy$ is a harmonic function then its conjugate harmonic function is
   A) $4xy - 2x^2 + 2y^2 + C$
   B) $4y^2 - 4xy + C$
   C) $2x^2 - 2y^2 + xy + C$
   D) $-4xy - 2x^2 + 2y^2 + C$
6. If $u(x, y) = x^3 + ax^2y + bxy^2 + 2y^3$ is a harmonic function then its conjugate harmonic function is
   A) $4xy - 2x^2 + 2y^2 + C$
   B) $4y^2 - 4xy + C$
   C) $2x^2 - 2y^2 + xy + C$
   D) $3x^2y - 6xy^2 - y^3 + 2x^3 + C$
7. If $u(x, y) = x^2 - y^2$ is a harmonic function then its conjugate harmonic function is
   A) $-x^2 + y^2$
   B) $x^2 + y^2$
   C) 2xy
   D) $-x^2 - y^2$
8. A function u is said to be harmonic if
   A) $u_{xx} + u_{yy} = 0$
   B) $u_{xy} + u_{yx} = 0$
   C) $u_x + u_y = 0$
   D) $u_x^2 + u_y^2 = 0$
9. If u and v are harmonic functions then $f(z) = u + iv$ is
   A) Analytic function
   B) Need not be Analytic function
   C) Analytic function only at $z = 0$
   D) None of the above

10. A function v is called a conjugate harmonic function for a harmonic function u in Ω whenever
    A) $f = u + iv$ is analytic
    B) u is analytic
    C) v is analytic
    D) None of the above
11. Assume that u is harmonic in a region Ω and for $z_0 \in \Omega, |z - z_0| < r \subset \Omega$ then the average value of u over the boundary of the disc is
    A) $u(z_0)$
    B) $ru(z_0)$
    C) $\frac{u(z)}{\pi r}$
    D) $\frac{4}{3}\pi r^3 u(z_0)$
12. The function $f(z)$ of complex variable z is given as$f(z) = x^3 - 3xy^2 + iv(x, y)$. For this function to be analytic $v(x, y)$ should be
    A) $3xy^2 - y^3 + C$
    B) $3x^2y^2 - y^3 + C$
    C) $x^3 - 3xy^2 + C$
    D) $3x^2y - y^3 + C$
13. Which of the following functions $u + iv$ are not analytic, given that u and v are harmonic?
    A) $u = \log(x^2 + y^2)\,, v = 2tan^{-1}\left(\frac{y}{x}\right)$
    B) $u = 2xy, v = x^2 - y^2$
    C) $u = e^y cosx, v = -e^y sinx$
    D) $u = 2x(1 - y), v = x^2 - y^2 + 2y$
14. Which of the following functions $u + iv$ are analytic, given that u and v are harmonic?
    A) $u = x^2 - y^2, v = \frac{-y}{x^2+y^2}$
    B) $u = e^y cosx, v = -e^x cosy$
    C) $u = log\sqrt{x^2 + y^2}, v = tan^{-1}\left(\frac{y}{x}\right)$
    D) $u = 2xy, v = x^2 - y^2$
15. Which of the following is/are true for analytic function $f(z) = u + iv$
    A) u is harmonic function
    B) v is harmonic function
    C) v is the conjugate harmonic function of u
    D) all of above
16. A continuous function $u(z)$ which satisfies the mean value property is
    A) Analytic
    B) Entire
    C) Harmonic
    D) Subharmonic
17. If $u(z)$ is a harmonic function and $v(z)$ is a subharmonic function defined in a region Ω, then
    A) $u(z) = v(z)$
    B) $u(z) \leq v(z)$
    C) $u(z) \geq v(z)$
    D) None of the above
18. $v(z)$ is a subharmonic function if
    A) $\Delta v > 0$
    B) $\Delta v < 0$
    C) $\Delta v = 0$
    D) None of the above
19. A continuous function $v(z)$ is subharmonic in Ω if and only if
    A) $v(z_0) \geq \frac{1}{2\pi}\int_0^{2\pi} v(z_0 + re^{i\theta})\, d\theta$

B) $v(z_0) = \frac{1}{2\pi}\int_0^{2\pi} v(z_0 + re^{i\theta})\, d\theta$
C) $v(z_0) \leq \frac{1}{2\pi}\int_0^{2\pi} v(z_0 + re^{i\theta})\, d\theta$
D) None of the above

20. Which of the following statements are not true if v_1 and v_2 are two subharmonic functions
A) kv_1 is subharmonic
B) $v_1 + v_2$ is subharmonic
C) $\max(v_1, v_2)$ is subharmonic
D) $\min(v_1, v_2)$ is subharmonic

21. A continuous function $v(z)$ in a region Ω satisfies the maximum principle means
A) v attains its maximum at a point in Ω
B) v attains its minimum at a point in Ω
C) v can have no maximum at a point in Ω
D) None of the above

22. In polar coordinates the Laplace's equation is
A) $r\frac{\partial}{\partial r}\left(r\frac{\partial u}{\partial r}\right) + \frac{\partial^2 u}{\partial \theta^2}=0$
B) $r\frac{\partial}{\partial r}\left(r\frac{\partial u}{\partial r}\right) + \frac{\partial u}{\partial \theta}=0$
C) $r\frac{\partial}{\partial r}\left(r\frac{\partial^2 u}{\partial r^2}\right) + \frac{\partial^2 u}{\partial \theta^2}=0$
D) None of the above

23. If $u \geq 0$ is any continuous function then the Poisson integral $P_u(z)$ satisfies
A) $P_u(z) = 0$
B) $P_u(z) \leq 0$
C) $P_u(z) \geq 0$
D) None of the above

24. If u is any continuous function which satisfies $m \leq u \leq M$, then the Poisson integral $P_u(z)$ satisfies
A) $m \geq P_u(z) \geq M$
B) $m \leq P_u(z) \leq M$
C) $m = P_u(z) = M$
D) None of the above

25. The arithmetic mean of a harmonic function over concentric circles $|z| = r$ is
A) $\alpha log r + \beta$
B) $\sqrt{\alpha log r}$
C) $e^{r\beta}$
D) None of the above

26. Limit of a uniformly convergent sequence of analytic function is
A) Analytic
B) Differentiable
C) Continuous
D) Not analytic

27. Laurent series expansion of f(z)=$\frac{1}{(z-1)(z-2)}$ valid in the region $1 < |z| < 2$ is
A) $\frac{-1}{z}\left(1+\frac{z}{2}+\frac{z^2}{4}+\cdots\right)+\frac{1}{2}(1+\frac{1}{z}+\frac{1}{z^2}+\cdots)$
B) $\frac{-1}{2}\left(1+\frac{z}{2}+\frac{z^2}{4}+\cdots\right)+\frac{1}{z}(1+\frac{1}{z}+\frac{1}{z^2}+\cdots)$
C) $\frac{-1}{2}\left(1+\frac{z}{2}+\frac{z^2}{4}+\cdots\right)-\frac{1}{z}(1+\frac{1}{z}+\frac{1}{z^2}+\cdots)$
D) $\frac{-1}{z}\left(1+\frac{z}{2}+\frac{z^2}{4}+\cdots\right)-\frac{1}{2}(1+\frac{1}{z}+\frac{1}{z^2}+\cdots)$

28. Laurent series of function f(z)= $\frac{1}{z(z-1)}$ for region |z|<1 is
A) $1- z-z^2- \dots$
B) $\frac{1}{z}+ 1+ z +z^2+\dots$
C) $-\frac{1}{z}- 1- z - z^2- \dots$

D) None of the above

29. Principal part of Laurent series of f(z)= $\frac{e^z-1}{z}$ is

A) z

B) $\frac{1}{z}$

C) $\frac{1}{z^2}$

D) 0

30. Mittag-Lefflers theorem states

A) Construction of meromorphic function

B) f is an irrational function

C) f is a rational function

D) f is a trigonometric function

31. Poles of f(z) = $\frac{\pi^2}{sin^2\pi z}$ are given by

A) z=n

B) z=nπ

C) z=$\frac{1}{n}$

D) z=$\frac{-1}{n}$

32. Taylor series expansion of f(x+h) in powers of h is

A) $f(x) + h f'(x) + \frac{h^2}{2!} f''(x) + \dots$

B) $f(x) + h f'(x) + h2 f''(x) + \dots$

C) $f(x) + h f'(x) - \frac{h^2}{2!} f''(x) + \dots$

D) $f(x) - h f''(x) + \frac{h^2}{2!} f''(x) - \dots$

33. Taylor series expansion of f(x) in powers of (x-a) is

A) $f(a) - (x-a)f'(a) + \frac{(x-a)^2}{2!} f''(a) - \frac{(x-a)^3}{3!} f'''(a) + \dots$

B) $f(a) + (x-a) f'(a) - \frac{(x-a)^2}{2!} f''(a) + \frac{(x-a)^3}{3!} f'''(a) + \dots$

C) $f(a) + (x-a) f'(a) + \frac{(x-a)^2}{2!} f''(a) + \frac{(x-a)^3}{3!} f'''(a) + \dots$

D) None of the above

34. Taylor series expansion of f(x) = e^x is given by

A) 1 + x + x^2 + x^3 + ...

B) 1- x + x^2 - x^3 + ...

C) 1 + x + $\frac{X^2}{2!}$ + $\frac{X^3}{3!}$ + ...

D) 1 – x - $\frac{X^2}{2!}$ - $\frac{X^3}{3!}$ + ...

35. Taylor series expansion of $f(x) = sin\ x$ is

A) 1 + $\frac{X^2}{2!}$ + $\frac{X^3}{3!}$ + ...

B) 1 - $\frac{X^2}{2!}$ + $\frac{X^4}{4!}$ + ...

C) x − $\frac{X^3}{3!}$ + $\frac{x^5}{5!}$ - ...

D) x + $\frac{X^3}{3!}$ +.$\frac{x^5}{5!}$ + ...

36. The Maclaurin's series expansion of $f(x) = e^{sinx}$ is

A) $1 + x + \frac{x^2}{2} + \frac{x^3}{3} + \dots$

B) $1 + \frac{x}{1!} + \frac{x^2}{2!} - \frac{x^4}{8} + \cdots$

C) $1 + x + x^2 + x^3 + \cdots$

D) $1 - x + -\frac{x^2}{2} + \frac{x^3}{3} + \cdots$

37. Gamma function have

A) Only one zero.

B) More than one zeros but finitely many.

C) No zeros
D) Infinitely many zeros.

38. The poles of $\Gamma(z)$ are
A) z = 0, -1, -2, -3, ...
B) z = 0, 1, 2, 3, ...
C) z = 1, 2, 3, 4, ...
D) z = 1, $\frac{1}{2}$, $\frac{1}{3}$, ...

39. Every entire function which is meromorphic in the whole plane is
A) The product of two entire functions
B) Quotient of two entire functions
C) Sum of two entire functions
D) Difference of two entire functions

40. Number of zeros of gamma function is
A) 1
B) ∞
C) 0
D) finite

41. $sin\ \pi z$ is an entire function of genus
A) 1
B) 2
C) 0
D) ∞

42. Genus of an entire function of the form C $z^m \prod_{n=1}^{\infty}(1-\frac{z}{an})$ with $\sum_{n=1}^{\infty} {}^{1}/_{|an|} < \infty$
A) 0
B) 1
C) 2
D) 3

43. Find the value of $\lim_{m\to\infty} \sum_{n=-m}^{m} \frac{(-1)^n}{z-n}$
A) $\frac{\pi}{sin\pi z}$
B) $cot\pi z$
C) $\frac{\pi}{cos\pi z}$
D) None of the above

44. Value of $\Gamma(n)$ is
A) (n-1)!
B) n!
C) (n+1)!
D) (2n-1)!

45. The value of $\Gamma(\frac{1}{2})$ is
A) $\sqrt{\pi}$
B) $\sqrt{2\pi}$
C) $\sqrt{4\pi}$
D) $\sqrt{\frac{\pi}{2}}$

46. Find the value of $e^{\pi z\, cot\pi\alpha} \prod_{-\infty}^{\infty}(1+\frac{z}{n+\alpha})\, e^{\frac{-z}{n+\alpha}}$
A) $sin\ \pi z$
B) $sin\ \pi(z+\alpha)$
C) $cos\ \pi z$
D) $cos\ \pi(z+\alpha)$

47. In Taylor series expansion of e^x about x = 2 , the coefficient of $(x-2)^4$ is
A) $\frac{2^4}{4!}$
B) $\frac{1}{4!}$
C) $\frac{e^2}{4!}$

D) $\frac{e^4}{4!}$

48. The expansion of arc sin z is

A) $z + \frac{1}{2}\frac{z^3}{3} + \frac{1.3}{2.4}\frac{z^5}{5} + \frac{1\ .3.5}{2.4.6}\frac{z^7}{7} + \ldots$

B) $z - \frac{z^3}{3} - \frac{1.3}{2.4}\frac{z^5}{5} + \frac{1.3.5}{2.4.6}\frac{z^7}{7}$ - ...

C) $z + \frac{1.3}{2.4}\frac{z^5}{5} + \frac{1.3.5}{2.4.6}\frac{z^7}{7} + \ldots$

D) None of the above

49. Find the expansion of $\frac{1}{\sqrt{1-z^2}}$

A) $1 + \frac{1}{2}\ z^2 + \frac{1.3}{2.4}z^4 + \frac{1.3.5}{2.4.6}\ z^6$ +...........

B) $1 - \frac{1}{2}\ z^2 - \frac{1.3}{2.4}z^4$ - $\frac{1.3.5}{2.4.6}\ z^6$ - ....

C) $1 + z^2 + \frac{1.3}{2.4}z^4 + \frac{1.3.5}{2.4.6}\ z^6$ +...........

D) None of the above

50. Find the value of $1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \cdots$

A) $\frac{\pi}{4}$

B) π

C) $\frac{\pi}{3}$

D) $\frac{2\pi}{5}$

51. State in which region the Riemann zeta function is analytic.

A) $\sigma > 1$

B) $\sigma < 1$

C) $\sigma = 1$

D) None of this

52. Closure of a family with respect to a distance function is compact then the family is ....

A) normal

B) totally bounded

C) equicontinuous

D) Bounded

53. The theorem says about the connection between equicontinuity and normality

A) Legendre 's relation

B) Arzela's Theorem

C) Cauchy residue theorem

D) Riemann mapping theorem

54. Zeta (0) will take the value

A) -1/2

B) 0

C) -1/12

D) 2

55. $\zeta(s) = 2^s \pi^{s-1} \sin(\frac{\pi s}{2})\Gamma(1-s)\zeta(1-s)$ which is known as_________

A) Riemann functional equation

B) Lebesgue integral functional equation

C) zeta functional equation

D) zero functional equation

56. The family F is normal if and only if F closure is_________

A) zero

B) constant

C) compact

D) normal

57. A family F is normal in Ω if every sequence $\{f_n\}$ of functions $f_n \in F$ consists a subsequence which converge uniformly on_________

A) Boundary of Ω

B) compact subset of Ω
C) normal subset of Ω
D) subset of Ω

58. Which theorem establishes the relationship between equicontinuity and normality of a family of functions?
A) Bolzano Weierstrass theorem
B) Arzela's theorem
C) Cauchy's theorem
D) Hadamard's theorem

59. The function z^n where n is a nonnegative integer form a normal family in which region?
A) $|z|<1$
B) $|z| >1$
C) both A and B
D) none of the above

60. Is a zeta function can be extended to a meromorphic function? Give its pole and residue
A) Yes, 1,1
B) Yes 1,0
C) Yes 0,0
D) None of the above

61. Riemann Conjecture asserts that all nontrivial zeros lie in the critical line
A) $\sigma = 1/2$
B) $\sigma = 1$
C) $\sigma < 1$
D) $\sigma = -2$

62. Zeta function has
A) Infinitely many zeros
B) Finitely many zeros
C) 0 as a zero
D) No real zeroes

63. Which of the following is true
A) Zeta function has zeros in the half plane S>1
B) Zeta function has no zeros in the half plane S<0
C) Zeta function has no zeros in the half plane S>1
D) Zeta function has no zeros in S>0

64. A family S of analytic functions is normal with respect to **C** if and only if
A) the functions in S are uniformly bounded on a set.
B) the functions in S are uniformly bounded on every compact set.
C) the functions in S are uniformly bounded on every closed set.
D) the functions in S are bounded on every set.

65. The family of functions F is normal if and only if its closure is _______
A) Constant
B) Compact
C) Normal
D) Relatively compact

66. A sequence $\{f_n\}$ of functions $f_n \in F$ converges with respect to a metric (distance function) ρ if and only if $\{f_n\}$ _______ on all compact subset of Ω.
A) Converges uniformly
B) Diverges
C) Strictly increasing
D) Bounded

67. If a metric space S is complete, then the family of functions F with values in S is normal if and only if F is _______
A) Relatively compact
B) Totally bounded

C) Normal
D) Compact

68. Each function in an equicontinuous family is
    A) absolutely continuous
    B) not absolutely continuous
    C) uniformly continuous
    D) not uniformly continuous

69. Every finite set of uniformly continuous function is
    A) equicontinuous
    B) uniformly equicontinuous
    C) not equicontinuous
    D) not uniformly equicontinuous

70. ζ(s) = 0 when s is $-2, -4, -6, \ldots$ these numbers are called
    A) trivial zeros
    B) constant functions
    C) zero functions
    D) continues functions

71. F is normal iff F is relatively ____________.
    A) compact
    B) constant
    C) zero
    D) None of these

72. A sequence $\{f_n\}$ converges with respect to metric δ if and only if the sequence $\{f_n\}$…….
    A) diverges
    B) converges
    C) constant
    D) None of these

73. A family F is________ if for every $\epsilon > 0$ there exists finite no of functions $f_1, f_2, \ldots, f_n$ such that every f ∈ F satisfies $\rho(f, f_j) < \epsilon$ for some f_j, $j \in \{1, 2, ..., n\}$
    A) totally bounded
    B) equicontinuous
    C) zero
    D) normal

74. The ζ-function can be extended to a meromorphic function in the whole plane whose only pole is a simple pole at s = 1 with the residue ________________.
    A) -1
    B) 0
    C) 1
    D) ½

75. A family of continuous functions with values in a metric space S is normal in the region of the complex plane if and only if it is ________________ on every compact set.
    A) connected
    B) equicontinuous
    C) uniformly continuous
    D) totally bounded

76. An analytic function $g(z)$ in Ω is said to be univalent if
    A) $g(z_1) = g(z_2)$ only for $z_1 = z_2$
    B) g is one to one
    C) g is an injection
    D) All of the above

77. Let f be a topological mapping of a region Ω onto a region Ω′. If $\{z_n\}$ or $z(t)$ tends to the boundary of Ω, then $\{f(z_n)\}$ or $f(z(t))$

A) Diverges to infinity
B) Tends to the boundary of Ω'
C) Tends to an interior point of Ω'
D) None of the above

78. Suppose that the boundary of a simply connected region Ω contains a line segment γ as a one-sided free boundary arc. Then the function $f(z)$ which maps Ω onto the unit disk can be extended to a function which is
A) Analytic and one to one on $\Omega \cap \gamma$
B) Analytic and one to one on $\Omega \cup \gamma$
C) One to one and onto on $\Omega \cap \gamma$
D) One to one and onto on $\Omega \cup \gamma$

79. A real or complex function $\varphi(t)$ of a real variable t, defined on an interval $a < t < b$, is said to be real analytic if, for every t_0 in the interval, the Taylor development of $\varphi(t)$
A) Converges in some interval $(t_0 - \rho, t_0 + \rho), \rho > 0$.
B) Converges in some interval $(t_0 - \rho, t_0 + \rho), \rho < 0$.
C) Converges in some interval $(t_0 - \rho, t_0 + \rho), \rho = 0$.
D) None of the above

80. An analytic arc $\varphi(t)$ is regular if
A) $\varphi'(t) = 0$
B) $\varphi'(t) \neq 0$
C) $\varphi'(t) > 0$
D) $\varphi'(t) < 0$

81. If every point of γ has a neighbourhood whose intersection with the whole boundary $\partial\Omega$ is the same as its intersection with γ, then γ is a
A) One sided boundary arc
B) Two-sided boundary arc
C) Free boundary arc
D) None of these

82. e^z has a period
A) 2π
B) πi
C) 2 πi
D) None of these

83. If ω is a period so are all
A) nω, n is an integer
B) ω/n, n is an integer
C) ω^n, n is an integer
D) None of these

84. $Sin\ z$ and $Cos\ z$ are simply periodic functions with period
A) 3π
B) 2π
C) 0
D) $2\pi i$

85. The doubly periodic meromorphic function is known as
A) Parabolic fuction
B) Elliptic function
C) Circular function
D) None of these

86. An elliptic function without poles reduces to
A) A constant
B) zero
C) $2\pi i$
D) None of these

87. The sum of the residues of an elliptic function is
A) $2\pi i$

B) infinity
C) 1
D) 0

88. An elliptic function with double pole at the origin as the only singularity is called the
A) Weirstrass ρ function
B) Weirstrass σ function
C) Weirstrass ζ function
D) None of these

89. The Weirstrass ζ function is
A) An even function
B) An odd function
C) Neither even nor odd
D) None of these

90. The Weirstrass ζ function is
A) $\zeta'(z) = -\rho(z)$
B) $\zeta(z) = -\rho'(z)$
C) $\zeta'(z) = \rho(z)$
D) $\zeta(z) = \rho'(z)$

91. The simple pole of Weirstrass ζ function is
A) Z=0 with residue 2
B) Z=2 with residue 1
C) Z=0 with residue 1
D) Z=1 with residue 0

92. The Weirstrass σ function is defined as
A) $\sigma(z) = z\prod_{\omega\neq 0}(1 - {}^{z}/_{\omega})e^{\frac{z}{\omega}+\frac{(\frac{z}{\omega})^2}{2}}$
B) $\sigma(z) = z\prod_{\omega\neq 0}(1 + {}^{z}/_{\omega})e^{\frac{z}{\omega}+\frac{(\frac{z}{\omega})^2}{2}}$
C) $\sigma(z) = z\prod_{\omega\neq 0}(1 - {}^{z}/_{\omega})e^{\frac{z}{\omega}-\frac{(\frac{z}{\omega})^2}{2}}$
D) $\sigma(z) = z\prod_{\omega\neq 0}(1 + {}^{z}/_{\omega})e^{\frac{z}{\omega}-\frac{(\frac{z}{\omega})^2}{2}}$

93. $z = 0$ and $z = \omega$ are the
A) Poles of $\sigma(z)$
B) Zeros of $\sigma(z)$
C) Removable singularities of $\sigma(z)$
D) Essential singularities of $\sigma(z)$

94. The Weirstrass σ function is
A) An even function
B) An odd function
C) Neither even nor odd
D) None of these

95. $\lim_{z\to 0}\frac{\sigma(z)}{z} =$
A) 0
B) 1
C) 2
D) 3

96. $\lim_{z\to 0}\frac{\sigma\prime(z)}{\sigma(z)} =$
A) $\rho(z)$
B) $\rho'(z)$
C) $\zeta(z)$
D) $\zeta'(z)$

97. The Weirstrass ρ function can be represented as
A) $\rho(z) = \frac{1}{z^2} + \sum_{\omega\neq 0}(\frac{1}{(z-\omega)^2} - \frac{1}{\omega^2})$ where the sum ranges over all $\omega = n_1\omega_1 - n_2\omega_2$ except 0.

B) $\rho(z) = \frac{1}{z^2} - \sum_{\omega \neq 0}(\frac{1}{(z-\omega)^2} - \frac{1}{\omega^2})$ where the sum ranges over all $\omega = n_1\omega_1 + n_2\omega_2$ except 0.

C) $\rho(z) = \frac{1}{z^2} - \sum_{\omega \neq 0}(\frac{1}{(z-\omega)^2} - \frac{1}{\omega^2})$ where the sum ranges over all $\omega = n_1\omega_1 - n_2\omega_2$ except 0.

D) $\rho(z) = \frac{1}{z^2} + \sum_{\omega \neq 0}(\frac{1}{(z-\omega)^2} - \frac{1}{\omega^2})$ where the sum ranges over all $\omega = n_1\omega_1 + n_2\omega_2$ except 0.

98. A function is said to be doubly periodic if there exist exactly two nonzero

A) dependent elements ω_1 and ω_2 such that $f(z+\omega_1) = f(z)\ and\ f(z+\omega_2) = f(z)$

B) independent elements ω_1 and ω_2 such that $f(z+\omega_1) = f(z)\ and\ f(z+\omega_2) = f(z)$

C) independent elements ω_1 and ω_2 such that $f'(z+\omega_1) = f'(z)\ and\ f'(z+\omega_2) = f'(z)$

D) dependent elements ω_1 and ω_2 such that $f'(z+\omega_1) = f'(z)\ and\ f'(z+\omega_2) = f'(z)$

99. A nonconstant elliptic function has equally many poles as it has

A) zeros

B) essential singularity

C) removable singularity

D) None of the above

100. Legendre's relation for Weierstrass ζ function is

A) $\eta_1\omega_1 + \eta_2\omega_2 = 2\pi i$

B) $\eta_1\omega_1 - \eta_2\omega_2 = 2\pi i$

C) $\eta_1\omega_2 + \eta_2\omega_1 = 2\pi i$

D) $\eta_1\omega_2 - \eta_2\omega_1 = 2\pi i$

....

Answers

1. B
2. A
3. B
4. A
5. A
6. D
7. C
8. A
9. A
10. A
11. A
12. D
13. B
14. C
15. D
16. C
17. C
18. A
19. C
20. D
21. C
22. A
23. C
24. B
25. A

26. A
27. C
28. C
29. D
30. A
31. A
32. A
33. C
34. C
35. C
36. B
37. A
38. A
39. B
40. C
41. A
42. A
43. A
44. A
45. A
46. B
47. C
48. A
49. A
50. A
51. A
52. A
53. B
54. A
55. A
56. C
57. B
58. B
59. C
60. A
61. A
62. A
63. C
64. B
65. B
66. A
67. B
68. C
69. B
70. A
71. A
72. B
73. A
74. C
75. B
76. D
77. B
78. B
79. A
80. B
81. C
82. C

83. A
84. B
85. B
86. A
87. D
88. A
89. B
90. A
91. C
92. A
93. B
94. B
95. B
96. C
97. D
98. B
99. A
100. D