QUESTION BANK

TYBSC -SEM VI , MATHS- I

1. $\lim\limits_{Z \to 0} \frac{Im(z)}{z}$

   (a) 1 (b) i (c) $-i$ (d) does not exist

2. $\lim\limits_{Z \to 0} \frac{z}{z}$

   (a) 1 (b) i (c) $-i$ (d) does not exist

3. If $f(z) = \begin{cases} \bar{z}^3 & if\ z \neq 0 \\ z & if\ z = 0 \end{cases}$ then

   (a) f is not continuous only at 0 (b) f is continuous on $\mathbb{C}$
   (c) f is discontinuous at 0 (d) None of the above

4. $f(z) = \frac{z^2+1}{z^3+9}$

   (a) Continuous and bounded in $|z| \leq 2$ (b) Continuous but not bounded in $|z| \leq 2$
   (c) Neither continuous nor bounded in $|z| \leq 2$ (d) Continuous and bounded everywhere

5. $f(z) = \frac{1}{z}$ is

   (a) Continuous and bounded in $|z| > 0$ (b) Continuous but not bounded in $|z| < 0$
   (c) Neither continuous nor bounded in $|z| > 0$ (d) Continuous and bounded everywhere

6. $\lim\limits_{n \to \infty} n\, i^n$ is

   (a) Does not exist (b) 1 (c) 0 (d) None of these

7. $\frac{(1-i)^{23}}{(\sqrt{3}-i)^{13}}$ in the polar form equals

   (a) $2^{-3}/_2\ e^{5i\pi}/_{12}$ (b) $e^{5i\,\pi/12}$ (c) $2^{-3/2}$ (d) None of these

8. $5e^{3\pi i}/_4 + 2e^{-\pi i}/_6$ equals

   (a) $\left(\frac{-5\sqrt{2}+2\sqrt{3}}{2}\right) + i\left(\frac{5\sqrt{2}-2}{2}\right)$ (b) 0 (c) 1 (d) i

9. $z = a + ib,\ z^n = 1.$ Then z^{n-1}expressed in the form $A + iB$ is

   (a) $a^{n-1} + ib^{n-1}$ (b) $a^{n-1} - ib^{n-1}$ (c) 0 (d) None of these

10. $z_1 = \frac{1}{2} + i, z_2 = \sqrt{2} + i(\sqrt{2} + 1), z_3 = 2 + 3i,\ \ z_4 = \frac{-1}{2} + i\sqrt{3}$, which of the points lie inside the circle $|z - i| = 2$

    (a) z_1, z_2, z_3 (b) z_1, z_2, z_4 (c) z_2, z_3, z_4 (d) None of these

11. Non- zero vectors z_1 & z_2 are perpendicular iff

(a) $Re(z_1 z_2) = 0$ (b) $Re\ z_1 \times Im\ z_2 = 0$ (c) $Re(z_1\bar{z}_2) = 0$ (d) $Im(\overline{z_1}, z_2) = 0$

12. Let $|z| = 1$ or $|w| = 1$. Then $|z - w| =$
(a) $|1 - \bar{z}w|$ (b) $|1 - z\,w|$ (c) $|1 - \bar{z}\bar{w}|$ (d) None of these
13. (i) $\bar{z} = z$ (ii) $Re(z) = \frac{z+\bar{z}}{2}$ (iii) $Im(z) = \frac{z-\bar{z}}{2i}$ (iv) $Re\,(iz) = -Im(z)$ (v) $\mathrm{Im}(iz) = R_e(z)$
a) Only (i), (ii), (iii) are true. b) Only (iv) (v) are true
c) All statements (i) (v) are true d) None of the above.

14. $\left(-\sqrt{3} - i\right)^{30} =$
(a) 2^{30} (b) -2^{30} (c) $-2^{30} - i$ (d) $2^{30} + i$
15. $f(z) = 4x^2 + i\,4y^2 =$
(a) $z + \bar{z}$ (b) $z\,\bar{z}$ (c) $(1-i)z^2 + (2+2i)z\,\bar{z} + (1-i)\bar{z}^2$ (d) None of these
16. If an ellipse $s(t) = 2\,cost + i\sin t$, $0 \le t \le 2z$ is rotated by $z/_6$ and centre shifted to $2 + i$, then parametric equation $r(t)$ of the resulting ellipse is
(a) $r(t) = \left(\sqrt{3}\,cost, \sqrt{2}\,sint\right)$
(b) $r(t) = \left(\sqrt{3}\,cost - \frac{1}{2}\sin t + 2, cost + \frac{\sqrt{3}}{2}\sin t + 1\right); 0 \le t \le 2\pi$
(c) $r(t) = \left(\sqrt{2}\,cost, \sqrt{3}sint\ \right)$
(d) None of these
17. The image of a circle under a linear transformation is
(a) straight line (b) circle (c) can be a straight line or a circle (d) any curve
18. $P(z) = a_0 + a_1 z + \cdots + a_n z^n$ is a polynomial of degree $n \ge 1$
Then for $k = 0$ to $n, a_k =$
(a) $k\,!\,p^k(0)$ (b) $\frac{P^k(0)}{k!}$ (c) $\frac{P^k(0)}{(K+1)!}$ (d) None of these
19. $\frac{d}{dz} z^n = n\mathbb{Z}^{n-1}$ is valid if
(a) $n \in \mathbb{Z},\ z \in \mathbb{C}$ (c) $n \in \mathbb{N},\ z \in \mathbb{C} \setminus \{0\}$
(b) $n \in \mathbb{Z} \setminus \{0\}, z \in \mathbb{C}$ (d) $n \in \mathbb{Z}\setminus\{0\}, z \in \mathbb{C}\setminus\{0\}$
20. $f'(z_0), g'(z_0)$ exists $g'(z_0) \ne 0$ $f(z_0) = 0 = g(z_0)$. Then $\lim_{z \to z_0} \frac{f(z)}{g(z)} =$
(a) does not exist (b) 0 (c) $\frac{f'(z_0)}{g'(z_0)}$ (d) $[f'(z_0) - g'(z_0)][g'(z_0)]^2$
21. $f(z) = {}^1/_z$, $z \ne 0$, $f'(z) =$
(a) does not exist (b) $-\frac{1}{z^2}$ (c) 0 (d) None of these
22. $f(z) = Rez.$ $f'(z)$ exists
(a) $\forall\, z \in \mathbb{C}$ (b) only at $z = 0$ (c) no where on $\mathbb{C}$ (d) exist only on real axis

23. $f(z) = Im\,Z,\ \ f'(z)$ exists

(a) $\forall\ z\ \in \mathbb{C}$ (b) only at $z = 0$ (c) no where on $\mathbb{C}$ (d) exists only on imaginary axix

24. $f(z) = z - \bar{z}\,, f'(z)$ exists

(a) only at 0 (b) only at i (c) on $\mathbb{C}$ (d) nowhere on $\mathbb{C}$

25. $f(z) = e^{-x}e^{-iy}$

(a) $f'(z)$ exists no where on $\mathbb{C}$ (b) $f'(z)$ exists on $\mathbb{C}$

(c)$f'(z)$ exists only at i (d) None of these

26. $f(z) = x^3 + i(1-y)^3$. Then

(a) f is differentiable only at $z = f'(z) = 3x^2$

(b) f is differentiable only at $z = i,\ \ f'(z) = 3z^2$

(c) f is differentiable only on $\mathbb{C}\& f'(z) = 3x^2 - i\,3(1-y)^2$

(d) f is differentiable only at $z = 0\& f'(z) = 0$

27. $f(z) = \begin{cases} \frac{\bar{z}^2}{z} & z \neq 0 \\ 0 & otherwise \end{cases}$

(a) Cauchy Riemann equations are not satisfied at $(0{,}0)$

(b) Cauchy Riemann equations are satisfied at $(0{,}0)$ but f is not differentiable at $(0{,}0)$

(c) Cauchy Riemann equations are not satisfied at $(0{,}0)$ but f is differentiable at $(0,0)$

(d) None of the above

(28) $F(z) = x^3 + 3xy^2 + i(y^3 + 3x^2y)$ is analytic

a) only at $1, i$ b) only at 0 c) only at $0, 1, i$ d) nowhere on *

(29) $f(z) = (2x - y) + i(Ax + By)$ is an entire function then

a) $A = 1\ \ ,B = 1$ b) $A = 3\ \ ,B = 3$ c) $A = 2\ \ ,B = 2$ d) none of these

(30) $f(z) = e^y \cos x + i\ e^y \sin x,\ \ g(z) = z + \bar{z}$. Then

a) Both f, g are analytic on $\mathbb{C}$ b) f analytic on $\mathbb{C}$ but g is not analytic on $\mathbb{C}$

c) $f$not analytic on $\mathbb{C}$ but g is not analytic on $\mathbb{C}$ d) Both f, g are not analytic on $\mathbb{C}$

(31) $f(z) = (z^2 - 2)e^{-x}e^{-iy}\,, g(z) = xy + iy\ \ \ h(z) = 2xy + i(x^2 - y^2)$

a) f is an entire function, g and h are no where analytic

b) g is an entire function, f and h are no where analytic

c) h is an entire function, f and g are no where analytic

d) f, g, h all of them are analytic on $\mathbb{C}$

(32) $f(z) = x^3 + 3xy^2 + i(y^3 + 3x^2y)$ is

a) an entire function b) analytic on the unit disk

c) differentiable an x-axis d) differentiable on x & y axes but analytic nowhere

(33) The singular point of$f(z)=\frac{2z+1}{z(z^2+1)}$ are

a) only at 0 b) $0, \pm i$ c) only at $\pm\ i$ d) None of these

(34) $f(x+i\,y)=x^3-3xy^2+i(3x^2y-y^3)$

a) f is analytic on $\mathbb{C}$ b) f is analytic only on the unit disk

c) f is analytic only on $\mathbb{C}\setminus\{0\}$ c) None of these

(35) The singular point of $f(z)=\frac{z^2+1}{(z+2)(z^2+2z+2)}$ are

a) $\pm\ i$ b) $-2, -1\pm\ i$ c) 0 d) None of these

(36) $u(x,y)=x^2-y^2, v=2xy$

a) v & u are harmonic conjugates of each other

b) u is a harmonic conjugate of $\frac{v}{u}$ but v is not

c) v is a harmonic conjugate of $\frac{u}{v}$ but u is not

d) None of these

(37) $u=ax^3+bx$y. For u to be harmonic, the value of a and b are

a) a=1 b=1 b) a=2 b=2 c) a=3 b=3 d)none of these

(38) $f(z)=\frac{1}{z}, z\neq 0.$ level sets of level sets of f real and imaginary parts of f are

a) Not orthogonal b) orthogonal c) equal c) None of these

(39) The image of a line under a fractional linear transformation is

a) a line b) a circle c) a line or a circle d) None of these

(40) The image of a circle under a Mobius transformation is

a) a point b) a line c) a circle d) a line or a circle

(41) $f(z)=i\,\frac{1-z}{1+z}$. The image of the unit circle under is

a) b) unit circle c) the imaginary axis d) the real axis

(42) The value of integral $\int_C \frac{e^z}{z-2}$, where C is the circle $|z|=3$, described in positive sense is ____________

a) $2\pi i\ e^2$ (b) $2\pi i$ (c) e^2 (d) None of these

(43) If f is analytic in a simply connected domain D, then for every closed path C in D we have______________

(a) $\int_C\ f(z)dz=1$ (b) $\int_C\ f(z)dz=0$ (c) $\int_C\ f(z)dz\neq 0$ (d) None of these

(44) The value of integral $\int_C \frac{z}{2z+1}\,dz$, where C is the circle $|z| = 1$, described in positive sense is ____________

(a) $\frac{\pi i}{2}$ (b) $\frac{-\pi i}{2}$ (c) 0 (d) None of these

(45) Let C be the circle centered at 0 and radius 3 traversed once in the anti-clockwise sense, then value of the integral $\int_C \frac{e^2 z}{(z+1)^4}\,dz$ is

(a) $\frac{4\pi i}{3}e^{-2}$ (b) $\frac{8\pi i}{3}e^{-2}$ (c) $\frac{-4\pi i}{3}e^{-2}$ (d) $\frac{-8\pi i}{3}e^{-2}$

(46) The value of the integral $\int_\Gamma z^2 dz$,where $\Gamma = \Gamma_1 \cup \Gamma_2$ is given by $\Gamma_1 : \gamma_1(t) = e^{it}, 0 \le t \le \pi$ and

$\Gamma_2 : \gamma_1(t) = e^{-it}, 0 \le t \le \pi$ is ___________

(a) $\frac{-4}{3}$ (b) $\frac{4}{3}$ (c) 4 (d) $\frac{3}{4}$

(47) Let C denotes the positively oriented boundary of the square whose sides lie on the lines $x = \pm 2$ and $y = \pm 2$, then $\int_C \frac{zdz}{2z+1}$ equals

(a) $\frac{-\pi i}{2}$ (b) $\frac{-\pi}{2}$ (c) $-2\pi i$ (d) $2\pi i$

(48) The value of integral $\int_C \frac{dz}{z^3(z+4)}$, where C is the circle $|z+2| = 3$, taken in counterclockwise direction equals____________

(a)$2\pi i$ (b) 0 (c) πi (d) None of these

(49) If $f(z)$ is analytic in domain D, then

(a) $f^{(n)}(z)$ exists in D

(b) $f^{(n)}(z)$ does not exists in D

(c) $f^{(n)}(z) = 0,\ \forall\, n \in \mathbb{N}$ in D

(d) insufficient data

(50) $I = \int_c \bar{z} dz$ where C is the line segment joining i to $-i$. Then I=

(a)Does not exist (b) 0 (c) 1 (d) $\frac{1}{2}$

(51) $f: \mathbb{C} \to \mathbb{C}, f(z) = \bar{z}^2$. Then $\int_C f$ where C is the line segment from 0 to $1+i$ is

(a) Does not exist (b) i (c) $\frac{2}{3}(1-i)$ (d) $-\frac{2}{3}(1-i)$

(52) $I = \int_r \bar{z}^2\, dz$ where $r: |z-1| = 1$. Then $I =$

(a)Does not exist (b) $4\pi i$ (c) i (d) None of these

(53) $I_n = \int_C (z-a)^n dz, n \in \mathbb{Z}$. $C: |z-a| = r$ with $a \in \mathbb{C},\ r > 0$, then $I_n =$

a) 0 $\forall n$ (b) $2\,\pi\, i\ \forall\ n$

(c) $I_n = 0$ for $n \neq -1, I_{-1} = 2\pi i$ (d) $I_{-1} = 0, I_n = 2\pi i;\ \forall\, n \neq -1$

(54) $\int_C \sin z\, dz = I,\ where\ C$ is any Jordan curve in the complex plane. Then $I =$

(a)π (b) $2\pi i$ (c) 0 (d) None of these

(55) $\int_C \frac{1}{(z^2+4)(z^2+9)}\, dz$ where $C: |z| = 1$ equals

(a) $2\pi i$ (b) 1 (c) 0 (d) None of these

(56) $I = \int_C \frac{z+1}{z^2(z-1)} dz$ where $C: |z-2| = \sqrt{2}$ traversed counter clockwise, then $I =$

(a) $4\pi i$ (b) 0 (c) 1 (d) π

(57) $\int_C \frac{z-1}{z^2(z-2)}\, dz;\quad C: |z| = 1$ equals

(a) π (b) $-\pi$ (c) $-\frac{\pi i}{2}$ (d) None of these

(58) $\int_C \frac{\cos Z}{z(z^2+8)}\, dz,\quad C$ is bounded by $x = \pm 2, y = \pm 2$ equals

(a) 0 (b) 1 (c) 2 (d) none of these

(59) If $f(z)$ is analytic at z_0 then following is the Taylor series of f at $z_0, \left(f^{(k)}\ represents\ k^{th}\ derivative\ of\ f.\right)$

(a) $\sum_{k=0}^{\infty} \frac{f^{(k)}(z_0)}{k!} z_0^k$ (b) $\sum_{k=0}^{\infty} \frac{f^{(k)}(z_0)}{k!} (z-z_0)^k$ (c) $\sum_{k=0}^{\infty} \frac{f^{(k)}(z_0)}{k!} (z+z_0)^k$ (d) None of these

(60) $f^{(3)}\,(0)$ for $f(z) = \sum_{n=0}^{\infty} (3 + (-1)^n)^n z^n$ is ______________

(a) 2 (b) 8 (c) -2 (d) None of these

(61) $g^{(3)}(0)$ for $g(z) = \sum_{n=0}^{\infty} \frac{(1+i)^n}{n} z^n$ is

(a) $\frac{2}{3}(i-1)$ (b) $4(i-1)$ (c) $\frac{2}{3}(1-i)$ (d) None of these

(62) If $f(z)$ is analytic in domain D, then__________

(a)$f^{(n)}(z)$ exists in D (b) $f^{(n)}(z)$ does not exists in D

(c) $f^{(n)}(z) = 0,\ \forall\, n \in \mathbb{N}$ in D (d) None of these

(63) $1 - z + z^2 \ldots\ldots\ldots$ for $|z| < 1$ is

(a) $\frac{1}{1-z}$ (b) $\frac{1}{i-z}$ (c) $\frac{1}{i+z}$ (d) $\frac{1}{1+z}$

(64) For $|z| < 1$, power series representation of $\frac{1}{(1-z)^2}$ is

(a)$1 + 2z + 3z^2 + \cdots$ (b) $\sum_{n=0}^{\infty} z^n$ (c) $\sum_{n=0}^{\infty} (-1)^n z^n$ (d) None of these

(65) For $|z| < 1$, power series representation of $\frac{1}{(1+z)^2}$ is

(a) $1 + 2z + 3z^2 + \cdots$ (b) $1 - 2z + 3z^2$ ....

(c) $\sum_{n=0}^{\infty} (-1)^n z^n$ (d) Does not exist in the given region

(66) The Taylor's expansion of $f(z) = z^8 e^{3z}$ around $z = 0$ is

(a) Does not exist (b) $\sum_{n=0}^{\infty} \frac{3^n}{n!} z^{n+8}$ (c) $\sum_{n=0}^{\infty} \frac{8^n}{n!} z^{n+3}$ (d) None of these

(67) $\exp\,(2 \pm 3\pi i) =$

(a) e^{-2} (b) $-e^2$ (c) e^2 (d) e^3

(68) $\exp\,(2 + \pi i/4) =$

(a) $\sqrt{\frac{e}{4}(2+i)}$ (b) $\sqrt{\frac{e}{4}(4+\pi)}$ (c) $\sqrt{\frac{e}{2}(1+i)}$ (d) $\sqrt{\frac{e}{4}(4-\pi)}$

(69) $\exp(z+\pi i) =$

(a) $\exp z$ (b) 0 (c) – $\exp(z)$ (d) None of these

(70) $|\exp(-2z)| < 1$ iff

(a) $\text{Re } z > 0$ (b) $Re\ z \geq 0$ (c) $Im\ z < 1$ (d) None of these

(71) If $e^z = 2$, then $z =$

(a) 0 (b) 1 (c) i (d) $z = ln\ 2 + (2n+1)\pi i \quad n = 0, \pm 1, \pm 2, \ldots$

(72) If e^z is real, then $Im\ z =$

(a) $n\pi,\ n = 0, \pm 1, \pm 2, \ldots$ (b) $\frac{n\pi}{2},\ n \in \mathbb{N}$ (c) i (d) $-i$

(73) $\overline{\exp(\imath\, z)} = \exp(i\bar{z})$ iff

(a) $z = n\frac{\pi}{2},\ n = 0, \pm 1, \ldots$ (b) $z = n\pi,\ n = 0, \pm 1, \pm 2, \ldots$ (c) $z = i$ (d) None of these

(74) $f(z) = \sin \bar{z}, \quad g(z) = \cos \bar{z}$

(a) f is analytic on $\mathbb{C}$ but g is not analytic anywhere on $\mathbb{C}$

(b) g is analytic on $\mathbb{C}$ but f is not analytic anywhere on $\mathbb{C}$

(c) f & g are both analytic on $\mathbb{C}$

(d) Neither f nor g is analytic anywhere on $\mathbb{C}$

(75) $\overline{\cos(\imath z)} = \cos(i\bar{z})$ for

(a) $z = n\,\pi\, i, n \in \mathbb{N}$ (b) $\forall\ z \in\ \mathbb{C}$ (c) for $z = 0$ (d) None of these

(76) $\overline{\sin(\imath\, z)} = \sin(i\bar{z})$ iff

(a) $z = n\,\pi i, n \in \mathbb{Z}$ (b) $\forall\ z \in\ \mathbb{C}$ (c) for $z = 0$ (d) None of these

(77) Roots of the equation $\sin hz = i$ are

(a) $z = \left(2n + \frac{1}{2}\right)\pi i, n \in \mathbb{Z}$ (b) $z = (n+1)\pi i, n \in \mathbb{Z}$

(c) $z = \frac{n\pi}{2};\ n \in \mathbb{Z}$ (d) None of these

(78) Roots of the equation $\cosh z = 1/2$ are

(a) $(2n+1)\pi i, n \in \mathbb{Z}$ (b) $z = \left(2n \pm \frac{1}{3}\right)\pi\, i, n \in \mathbb{Z}$

(c) $(2n+1)\frac{\pi}{2} i, n \in \mathbb{Z}$ (d) $z = \left(2n - \frac{1}{3}\right)\pi\, i,\ n \in \mathbb{Z}$

(79) The function $\frac{1}{z^2+4}$ is ……….

a) Analytic for all $z\ \in \mathbb{C}$ b) Analytic only at $z = 2i$

c) Not analytic at $z = \pm 2i$ d) None of these

(80) The series $\sum_{n=0}^{\infty} \frac{(100+75i)^n}{n!}$ is ____________

(a) Convergent (b) Divergent (c) Absolutely Convergent (d) None of these

(81) Radius of convergent of the series $\sum_{n=0}^{\infty} \frac{n!}{n^n} z^n$ is _______________

(a) ∞ (b) e (c) 1 (d) None of these

(82) Radius of convergence of the series $\sum_{n=0}^{\infty} \frac{(z-2i)^n}{n^n}$ is ___________

(a) ∞ (b) 1 (c) 2 (d) None of these

(83) The radius of convergence of the power series $\sum_{n=0}^{\infty} n^2(z-i)^{2n}$ is ______

(a) 1 (b) ∞ (c) $\frac{1}{2}$ (d) None of these

(84) If $\sum_{n=0}^{\infty} a_n z^n$ has radius of convergence R than the series $\sum_{n=0}^{\infty} a_n z^{2n}$ has radius of convergence________

(a) R^2 (b) $\frac{1}{R^2}$ (c) $\sqrt{R}$ (d) None of these

(85) Radius of convergence of the series $\sum_{n=0}^{\infty} \frac{z^n}{3^n+1}$ is ____________

(a) $\frac{1}{3}$ (b) 3 (c) Does not exists (d) None of these

(86) The Laurent series for $f(z) = \frac{z+1}{z}$ around $z_0 = 0$ is

(a) $-1-\frac{1}{z^2}$ (b) $1+1/z$ (c) $1-\frac{1}{z}$ (d) dosen't exist

(87) The principal part in the LS expansion of $f(z) = \frac{z}{z^2+1}$ around $z_0 = i$ is

(a) $\frac{1}{z+i}$ (b) $\frac{-1}{2(z+i)}$ (c) $\frac{1}{2(z-i)}$ (d) None of these

(88) The principal part in the LS expansion of $f(z) = \frac{8z+1}{z(1-z)}, 0 < |z| < 1$ is

(a) $\frac{1}{z}$ (b) $\frac{1/8}{z}$ (c) $-1/8z$ (d) None of these

(89) The circle of convergence for the power series $\sum_{n=0}^{\infty} \frac{(2n)!}{(n!)^2} (z-3\,i)^n$ is

(a) $|z-3i| < 1/4$ (b) $|z-3i| < 1$ (c) $|z-3i| > 1$ (d) $|z-3i| > 1/4$

(90) $\sum_{n=0}^{\infty} \left[1+(-1)^n+\frac{1}{2^n}\right] z^n$ converges for

(a) $|z| < 1$ (b) $|z| < 1/2$ (c) $-1 < |z| < 1$ (d) None of these

(91) The principal part in the Laurent series expansion of $f(z) = \frac{z+1}{z^3(z^2+1)}$ on $0 < |z| < 1$ is

(a) $\frac{1}{z^3}+\frac{1}{z^2}-\frac{1}{z}$ (b) $\frac{-1}{z^3}+\frac{1}{z^2}-\frac{1}{z}$ (c) $\frac{1}{z^3}-\frac{1}{z^2}+\frac{1}{z}$ (d) None of these

(92) The principal part in the Laurent Series expansion of $f(z) = \frac{1}{z(z-1)}$ in $0 < |z| < 1$ is

(a) $\frac{1}{z}$ (b) $-\frac{1}{z}$ (c) $\frac{-1}{z^3}+\frac{1}{z^2}-\frac{1}{z}$ (d) None of these

(92) The residue of f at $z = 0$ of $f(z) = z\cos\frac{1}{z}$ is …………

a) $\frac{1}{2}$ b) $\frac{-1}{2}$ c) 1 d) None of these

(93) If $f(z) = \frac{z^2}{(z-1)^2(z+2)}$, then $Res\, f(-2)$ is ……….

a) $\frac{5}{9}$ b) $\frac{4}{9}$ c) $\frac{1}{9}$ d) None of these

(94) Let $f(z) = \frac{1}{(z-4)^4(z+3)^6}$, then $z = 4$ and $z = -3$ are the poles of the order………..

a) 6 and 4 b) 3 and 4 c) 4 and 6 d) None of these

(95) The value of the integral $\int_C \frac{z+1}{z^3-2z^2}\, dz$, where C is the circle $|z| = 1$ is equal to …...

a) $2\pi i$ b) $\frac{-2\pi i}{3}$ c) 0 d) None of these

(96) The pole p of order m of $f(z)=\left(\frac{z}{2z+1}\right)^3$ is………….

a) $p=\frac{1}{3}, m=3$ b) $p=\frac{-1}{2}, m=3$ c) $p=0,\ m=3$ d) None of these

(97) $f(z)=\frac{\sin z}{(z-\pi)^2}$ have pole of order……..

a) 1 b) 2 c) 3 d) None of these

(98) The poles of the function $\frac{\sin z}{\cos z}$ are at………

a) $\frac{(2n+1)\pi}{2}, n$ is any integer b) $\frac{2n\pi}{3}, n$ is any integer

c) $n\pi,\ n$ is any integer d)None of these

(99) The integral $\int_C \frac{1+z}{z(2-z)}\,dz$, where C is the unit circle $|z|=1$ is……….

a) $2\pi i$ b) πi c) 0 d) None of these

(100)The residue at $z=ia$ of $f(z)=\frac{1}{(z^2+a^2)^2}$ is………………

a) 0 b) $\frac{1}{4a^3}$ c) $\frac{-1}{4a^3}$ d) None of these

(101)The residue at $z=0$ of $f(z)=z^2\sin\left(\frac{1}{z}\right)$is………

a) $\frac{-1}{6}$ b) $\frac{1}{6}$ c) -1 d) None of these

(102)The integral $\int_C \frac{dz}{z\sin z}\,dz$,where C is the unit circle $|z|=1$ is ………

a) $2\pi i$ b) πi c) 0 d) None of these

(103)The integral $\int_C ze^{\frac{1}{z}}\,dz$,where C is the unit circle $|z|$ =1 is ………

a) $2\pi i$ b) πi c) 0 d) None of these

(104)$f(z)=\frac{\sin z}{(z-3)^2}$. f has a pole of

(a) order 3 at $z=2$ (b) order 2 at $z=3$ (c) order 2 at $z={}^{3}/_{\pi}$ (d) None of these

(105)$f(z)=\frac{z+3}{\sin z}\cdot f$ has a pole of

(a) order 1 at $n\pi, n\in\mathbb{Z}$ (b) order 2 at $n\pi, n\in\mathbb{Z}$

(c) order 1 at ${}^{n\pi}/_{2}, n\in\mathbb{Z}$ (d) None of these

(106)$f(z)=\left(\frac{z+1}{z-1}\right)^3\cdot \underset{z=1}{Res} f(z)=$

(a) 1 (b) 0 (c) 6 (d) -6

(107)$f(z)=\frac{1}{(z-1)^2(z-3)}\cdot \underset{z=1}{Res} f(z)=$

(a) ${}^{1}/_{4}$ (b) ${}^{-1}/_{4}$ (c) 0 (d) 1

(108)$f(z)=e^{3/z}$. then

(a) $'0'$ is an essential singularity of f (b) $'0'$ is a pole of f

(c) $'0'$ is a removable singularity of f (d) None of these

(109) $f(z) = \frac{z^3}{z-1}$. $\underset{z=1}{Res} f(z) =$

(a) 0 (b) 1 (c) -1 (d) $-1/3$

(110) $f(z) = e^z/1+z$. Then

(a) $'0'$ is an essential singularity of f (b) $'0'$ is a pole of f

(c) $'0'$ is a removable singularity of f (d) None of these

111) $\lim_{z\to i} \frac{3z^4-2z^3+8z^2-2z+5}{z-i} = ?$

(a) 4+4i (b)4-4i (c) 2+2i (d) 2-2i

112) $\lim_{z\to i} \frac{z^3+2z^2+(2+2i)z+i}{z+i} = ?$

(a) -1+2i (b) –(1+2i) (c) 1+2i (d) 1-2i

113) $\lim_{z\to i+1} (z^2 - 5z + 10) = ?$

(a) -5+3i (b) –(5+3i) (c) 5+3i (d) 5-3i

114) If f(z) = $\bar{z}$ then

(a) f is analytic at z=0

(b) f is analytic everywhere in the complex plane except at z=0

(c) f is analytic everywhere in the complex plane

(d) f is not analytic at any point in the complex palne.

115) If f(z) = $\bar{z}$ then

(a) f is continuous everywhere in the complex plane

(b) f is continuous only at z=0

(c) f is differentiable at z=0

(d) f is analytic everywhere in the complex plane.

116) $\frac{d}{dz}\bar{z}$

(a) $\frac{1}{\bar{z}}$ (b) 1 (c) -1 (d) does not exist.

117) sin iz =

(a) $isinh$z (b) $icoshiz$ (c) $isinz$ (d) $icosz$

118) cos iz =

(a) $sinhz$ (b) $icoshiz$ (c) $coshz$ (d) $icosz$

119) sinh iz =

(a) $icosz$ (b) $isin\ z$ (c) cosz (d) sin z

120) cosh iz

(a) $icosz$ (b) $isin\ z$ (c) cosz (d) sin z

121) tan iz =

(a) $itanhz$ (b) $tanz$ (c) $tanhiz$ (d) $cotz$

122) tanh iz =

(a) $tanz$ (b) $itanz$ (c) $taniz$ (d) $cotz$

123) $sinz =$

(a) $\frac{e^{iz}-e^{iz}}{2}$ (b) $\frac{e^{iz}+e^{iz}}{2}$ (c) $\frac{e^{iz}-e^{iz}}{2i}$ (d) $\frac{e^{iz}+e^{iz}}{2i}$

124) $cosz =$

(a) $\frac{e^{iz}-e^{iz}}{2}$) (b) $\frac{e^{iz}+e^{iz}}{2}$ (c) $\frac{e^{iz}-e^{iz}}{2i}$ (d) $\frac{e^{iz}+e^{iz}}{2i}$

125) $sinhz =$

(a) $\frac{e^{z}-e^{-z}}{2}$) (b) $\frac{e^{z}-e^{-z}}{2i}$ (c) $\frac{e^{z}+e^{-z}}{2}$ (d) $\frac{e^{z}+e^{-z}}{2i}$

126) $coshz =$

(a) $\frac{e^{z}-e^{-z}}{2}$) (b) $\frac{e^{z}-e^{-z}}{2i}$ (c) $\frac{e^{z}+e^{-z}}{2}$ (d) $\frac{e^{z}+e^{-z}}{2i}$

127) If f is integrable along a curve C whose length is L and if there exist positive number M such that $|f(z)| \leq M$ on C then $|\int_C f(z)dz|$ is

(a) 0 (b) $\leq$ ML (c) $\leq ML^2$ (d) non existing number.

128) If f(z) is is analytic inside and on a Circle C having the centre at a and of radius r and suppose $|f(z)| \leq M$ for some constant M then $|f^n(a)|$ is $\leq$

(a) $\frac{Mn!}{r^{n-1}}$ for all n=0,1,2,…..

(b) $\frac{Mn!}{r^{n}+1}$ for all n=0,1,2,…..

(c) $\frac{Mn!}{r^{n+1}}$ for all n=0,1,2,…..

(d) $\frac{Mn!}{r^{n}}$ for all n=0,1,2,…..

129) $\int_C \bar{z}\, dz$ along the line joining z= 0 to z=2i is

(a) 1 (b) 2 (c) 3 (d) 4

130) $\int_C \bar{z}\, dz$ along the line joining z= 2i to z= 4+2i is

(a) -8-8i (b) -8+8i (c) 8-8i (d) 8+8i

131) $\lim_{Z\to i} z^2 + 1 =$

(a) 1 (b) -1 (c) -i (d) i

132) $\lim_{Z\to -i} z^2 + 1 =$

(a) 1 (b) -1 (c) -i (d) i

133) $\lim_{Z\to 2i} z^2 + 1 =$

(a) 3 (b) -3 (c) -i (d) i

134) $\lim_{Z\to -2i} z^2 + 1 =$

(a) 3 (b) -3 (c) -i (d) i

135) $\lim_{Z\to 3i} z^2 + 1 =$

(a) 8 (b) -8 (c) -i (d) i

136) $\lim_{Z\to -3i} z^2 + 1 =$

(a) 8 (b) -8 (c) -i (d) i

137) $\lim_{Z \to 2i} 2z + 1 =$

(a) 4i+1 (b) 22i+1 (c) -i (d) i

138) $\lim_{Z \to -2i} 2z + 1 =$

(a) -4i+1 (b) 22i+1 (c) -4i-1 (d) i

139) If f(z)= $\frac{z^2}{z-2}$ then $Res_{z=2} f(z) =$

(a) 4 (b) 6 (c) 8 (d) 2

140) If f(z)= $\frac{z^2+3}{z-3}$ then $Res_{z=3} f(z) =$

(a) 6 (b) 12 (c) 18 (d) 24

141) If f(z)= $\frac{z^3}{z-2}$ then $Res_{z=2} f(z) =$

(a) 2 (b) 4 (c) 6 (d) 8

142) If f(z)= $\frac{z^2+2z-1}{z-2}$ then $Res_{z=2} f(z) =$

(a) 1 (b) 3 (c) 5 (d) 7

143) If f(z)= $\frac{z^2+z+1}{z+2}$ then $Res_{z=-2} f(z) =$

(a) 0 (b) 1 (c) 2 (d) 3

144) $\oint_C \frac{e^{2z}}{(z+1)^4} dz$ where C is the Circle |z|=3 is

(a) $8\pi i e^{\frac{2}{3}}$ (b) $8\pi i e^{\frac{-2}{3}}$ (c) πi (d) -πi

145) $\oint_C \frac{e^{z}}{z-2} dz$ where C is the Circle |z|= 1 is

(a) πi (b) -πi (c) -1 (d) 0

146) $\oint_C \frac{\sin 3z}{z+\frac{\pi}{2}} dz$ where C is the Circle |z|=5 is

(a) 2πi (b) -2πi (c) πi (d) -πi

147) $\oint_C \frac{e^{z}}{z-2} dz$ where C is the Circle |z|=3 is

(a) 2πi (b) -2πi (c) $2\pi i e^2$ (d) $2\pi i e^{-2}$

148) $\oint_C \frac{e^{3z}}{z-\pi i} dz$ where C is the Circle |z-1|= 4 is

(a) πi (b) -πi (c) 2πi (d) -2πi

149) $\oint_C \frac{e^{iz}}{z^3} dz$ where C is the Circle |z|= 2 is

(a) πi (b) -πi (c) 2πi (d) -2πi

150) $\oint_C \frac{\sin^6 z}{(z-\frac{\pi}{6})} dz$ where C is the Circle |z|=1 is

(a) $\frac{\pi i}{32}$ (b) $\frac{-\pi i}{32}$ (c) $\frac{3\pi i}{32}$ (d) $\frac{-3\pi i}{32}$