

## UNIT-4 COMPLEX DIFFERENTIATION

### Multiple Choice Questions

1. An Analytic function  $f(z) = u(x, y) + iv(x, y)$  then  $u(x, y)$  &  $v(x, y)$  must satisfy-  
a.  $u_x = v_y$  &  $u_y = -v_x$       b.  $u_x = v_y$  &  $u_y = v_x$       c. None      d. none      [Ans.a]
2. Let  $f_1(z) = z^2$  &  $f_2(z) = \bar{z}$  be two complex variable functions. .... [ ] [Ans.b]  
a. Both are analytic      b. only  $f_1(z)$  is analytic      c. only  $f_2(z)$  is analytic      d. none
3. If  $f(z) = (x^2 + ay^2) + ibxy$  is analytic function then----- [ ] [Ans.b]  
a.  $a = -1$  &  $b = -1$       b.  $a = -1$  &  $b = 2$       c.  $a = 1$  &  $b = 2$       d.  $a = 1$  &  $b = -2$
4. Let  $z = x + iy$  then  $\overline{\cos z} =$ ----- [ ] [Ans.b]  
a.  $\cos z$       b.  $\cos \bar{z}$       c.  $\sin z$       d. None
5.  $\lim_{z \rightarrow i} \frac{z^2 + 1}{z^3 + 2z - i(z^2 + 2)} =$ ----- [ ] [Ans.d]  
a.  $-2i$       b.  $-i$       c.  $i$       d.  $2i$
6. If  $2x - x^2 + ay^2$  is to be harmonic, then  $a$  Should be----- [ ] [Ans.a]  
a. 1      b. -3      c. -2      d. -1
7. Solutions of Laplace's equation having continuous II order partial derivatives are called [Ans.b]  
a. Biharmonic functions      b. harmonic functions      c. Conjugate harmonic functions  
d. none
8.  $w = \frac{1}{z}$  is analytic everywhere except at ----- [ ] [Ans.b]  
a.  $z = \infty$       b.  $z = 0$       c.  $z = -1$       d. None
9. Real part of  $w = e^{z^2}$  ----- [ ] [Ans.a]  
a.  $u = e^{x^2 - y^2} \cos 2xy$       b.  $u = e^{x^2} \cos 2xy$       c.  $u = e^{x^2 - y^2} \sin 2xy$       d. none
10. Imaginary part of  $\sin \bar{z}$  is ----- [ ] [Ans.c]

- a.  $\sin x \sinh y$       b.  $\cos x \sinh y$       c.  $-\cos x \sinh y$       d. None

Fill in the blanks

1. Analytic function of an analytic function is ----- [Ans: Analytic ]
2.  $f(z) = \bar{z}$  is not ----- anywhere . [Ans: Differentiable ]
3.  $\lim_{z \rightarrow 1} \frac{z^2-1}{z-1} =$  ----- [Ans: 2 ]
4. Polar form C – R Equations ----- [Ans:  $u_r = \frac{1}{r} v_\theta$ ,  $v_r = -\frac{1}{r} u_\theta$  ]
5. If  $f(z) = z\bar{z}$  then  $u =$ -----,  $v =$  -----[Ans:  $x^2 + y^2, 0$  ]
6.  $w = z^3 - 4z + 1$  is analytic -----[Ans: Everywhere ]
7. Real part of  $e^z$  -----[Ans:  $e^x \cos y$  ]
8.  $w = \frac{z+2}{z(z^2+1)}$  is not analytic at----- [Ans: 0,  $\pm i$  ]
9.  $u(x, y)$  is said be harmonic if ----- [Ans:  $\nabla^2 u = 0$  ]
10. Imaginary part of  $e^{iz}$  -----[Ans:  $e^{-y} \sin x$  ]