Q.No	Question
1.	a) Find the modulus and amplitude of $\frac{(1+i)^2}{(3+i)}$. b) Define the neighborhood of a complex variable with Geometrical interpolation.
2.	a) Determine the region in the z-plane represented by i) $1<\|z+2i\|\leq 3$ ii) $R(z) >3$ iii) $\frac{\pi}{6}\leq amp\ (z)\leq \frac{\pi}{3}$ b) Define the following : i) Limit of a complex function ii) Continuity of a complex function iii) Differentiability of a complex function
3.	a) If $f(z)=u+iv$ is analytic, then prove that Cauchy- Riemann equations $u_x=v_y, v_x=-u_y$ are true. b) If $f(z)=u(r,\theta)+i\ v(r,\theta)$ is analytic, then prove that Cauchy- Riemann equations in polar form $\frac{\partial u}{\partial r}=\frac{1}{r}\frac{\partial v}{\partial \theta}$ and $\frac{\partial v}{\partial r}=-\frac{1}{r}\frac{\partial u}{\partial \theta}$ are true.
4.	a) If $u=x^2-y^2,\ v=x^3-3xy^2$ Show that $u\ and\ v$ are harmonic functions but $f(z)=u+iv$ is not analytic. b) If $u=\frac{x^2}{y},\ y\neq 0$ and $v=x^2+2y^2,$ then show that the curve $u=constant$ and $v=constant$ are orthogonal but $f(z)=u+iv$ is not an analytic function.
5.	a) Show that $f(z)=z^n$ is analytic. Hence find its derivative. b) Show that the function $f(z)=logz$ is analytic and hence find its derivative.
6.	a) Show that the function $f(z)=coshz$ is analytic and hence find its derivative. b) Show that $w=z+e^z$ is analytic and hence find $\frac{dw}{dz}$.
7.	a) Show that the function $f(z)=sin2z$ is analytic and hence find its derivative. b) Find the analytic function $f(z)=u+iv$, where $u=x^2-y^2+\frac{x}{x^2+y^2}$
8.	a) Find the analytic function whose real part is $log\sqrt{x^2+y^2}$. b) Find the analytic function $f(z)=u+iv$, where $v=\frac{y}{x^2+y^2}$.
9.	a) Find the analytic function $f(z)=u+iv$, where $v=e^x(xsiny+ycosy)$ using Milne Thompson method. b) Find the analytic function $f(z)=u+iv$, where $u=e^{-x}\{(x^2-y^2)cosy+2xysiny\}$ using Milne Thompson method.
10.	a) Find the analytic function $f(z)=u(r,\theta)+iv(r,\theta)$, where $v(r,\theta)=r^2cos2\theta-rcos\theta+2$ using Milne Thompson method. b) Find the analytic function $f(z)=u(r,\theta)+iv(r,\theta)$, where $u(r,\theta)=\frac{cos2\theta}{r^2}$ using Milne Thompson method.
11.	a) Find the analytic function $f(z)=u+iv$, where $v=-\frac{sin\theta}{r}$ using Milne Thompson method. b) Find the analytic function $f(z)=u+iv$, where $u=r^2cos2\theta$
12.	a) Show that $u=e^{2x}(xcos2y-ysin2y)$ is harmonic and find its harmonic conjugate.

	b) Show that $u = e^x \cos y + xy$ is harmonic and find its harmonic conjugate and also find the corresponding analytic function.
13.	a) Show that $v = \cos x \sinh y$ is harmonic and find its harmonic conjugate and also find the corresponding analytic function. b) Show that $u = x^3 - 3xy^2 - 3x^2 + 3y^2 + 1$ is harmonic and find its harmonic conjugate.
14.	a) Show that $u = \left(r + \frac{1}{r}\right)\cos\theta$ is harmonic and find its harmonic conjugate. b) Show that $v = \left(r - \frac{1}{r}\right)\sin\theta$ is harmonic and find its harmonic conjugate.
15.	a) Show that $v = r\sin\theta + \frac{\cos\theta}{r}$ is harmonic and find its harmonic conjugate and also find the corresponding analytic function. b) Show that $u = \frac{\cos\theta}{r}$ is harmonic and find its harmonic conjugate and also find the corresponding analytic function.
16.	a) Show that $u = x^2 + 4x - y^2 + 2y$ is harmonic and find its harmonic conjugate and also find the corresponding analytic function. b) Show that $v = 2xy - 2x + 4y$ is harmonic and find its harmonic conjugate and also find the corresponding analytic function.
17.	a) Find the analytic function $f(z) = u + iv$ if $u + v = \frac{1}{r^2}(\cos 2\theta - \sin 2\theta)$ $(r \neq 0)$. b) Find the analytic function $f(z) = u + iv$ if $u + v = r(\cos\theta + \sin\theta) + \frac{1}{r}(\cos\theta - \sin\theta)$
18.	a) Find the analytic function $f(z) = u + iv$ if $u + v = (x + y) + e^x(\cos y + \sin y)$. b) Find the analytic function $f(z)$ as a function of z gives the sum of its real and imaginary part is $x^3 - y^3 + 3xy(x - y)$.
19.	a) Find the analytic function $f(z) = u + iv$ if $u - v = (x - y)(x^2 + 4xy + y^2)$ b) Find the analytic function $f(z) = u + iv$ if $u - v = e^x(\cos y - \sin y)$
20.	a) An electrostatic field in the xy-plane is given by the potential function $\emptyset = 3x^2y - y^3$, find the stream function. b) Two concentric circular cylinders of radii r_1, r_2 $(r_1 < r_2)$ are kept at potentials $\emptyset_1$ and $\emptyset_2$ respectively. Using complex function $\omega = a\log z + c$, prove that the capacitance per unit length of the capacitor formed by them is $\frac{2\pi\lambda}{\log(r_2|r_1)}$ where λ is the dielectric constant of the medium.