NIET Greater Noida	**ENGINEERING MATHEMATICS III (AAS0301A) UNIT-I**	**SESSION: 2022-23** **Branch: CSE/IT/CS** **Sem: III**

Assignment Given Date: 14/09/22 Assignment Submission Date: 23/09/22	Maximum Points: 75 Weightage in University Exam: 30 Marks
Faculty Name: Mr. Raman Chauhan	Faculty Mail Id: ramanchauhan.m@niet.co.in

Note: Write solution of each question in clear handwriting.

Q.N.	Question Statement	Pts	CO	BLOOM'S KNOWLEDGE LEVEL
1	Show that the function $f(z) = \frac{x^3y^5(x+iy)}{x^6+y^{10}}$, $z \neq 0, f(0) = 0$ is not analytic at the origin even though it satisfies C.R. equation at origin.	10	1	K_5
2	Show that if $f(z)$ is analytic and $Ref(z) = constant$ then $f(z)$ is constant.	2	1	K_5
3	Find the value of a, b and c such that the function $f(z) = -x^2 + xy + y^2 + i(ax^2 + bxy + cy^2)$ is analytic. Express $f(z)$ in terms of z.	5	1	K_6
4	Show that $v(x, y) = e^{-x}(xcosy + ysiny)$ is harmonic. Find its harmonic conjugate.	6	1	K_5
5	Find analytic function $f(z)$ in terms of z whose real part is $\frac{sin2x}{cosh2y+cos2x}$	6	1	K_6
6	If $f(z) = u + iv$ is an analytic function of z and $u - v = \frac{cosx+\sin x-e^{-y}}{2\cos x-2\cos hy}$. Prove that $f(z) = \frac{1}{2}(1 - cot\, z)$ when $f\left(\frac{\pi}{2}\right) = 0$.	10	1	K_5
7	If $f(z)$ is a regular function of z, prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)\lvert f(z)\rvert^2 = 4\lvert f'(z)\rvert^2$	10	1	K_5
8	Find an analytic function $f(z)$ such that $Re[f'(z)] = 3x^2 - 4y - 3y^2$ and $f(1 + i) = 0$ & $f'(0) = 0$.	6	1	K_4, K_6

9	Find the image of $\lvert z-3i\rvert = 3$ under the transformation $w=\frac{1}{z}$.	6	1	K_6
10	Find the bilinear transformation which maps the points $z = 0,1,\infty$ into the points $w = i, 1, -i$ respectively.	2	1	K_6
11	Find the image of the real axis of the z-plane on the w-plane by the transformation $w=\frac{1}{z+i}$	6	1	K_6
12	Show that the transformation maps a circle $w=\frac{2z+3}{z-4}$ maps the circle $x^2+y^2-4x=0$ onto the straight line $4u+3=0$.	6	1	K_4, K_6

Solution:

1. **Prove**
2. **Prove**
3. $\boldsymbol{a=\frac{1}{2}, b=-2, c=\frac{1}{2}, f(z)=-\frac{1}{2}(2+i)z^2}$
4. $\boldsymbol{u = e^{-x}(xsiny-ycosy)+c}$
5. $\boldsymbol{f(z) = tanz+c}$
6. **Prove**
7. **Prove**
8. $\boldsymbol{f(z) = z^3+2iz^2+6-2i}$
9. $\boldsymbol{6v+1=0}$
10. $\boldsymbol{w=\frac{z+i}{1+zi}}$
11. $\boldsymbol{u^2+v^2+v=0}$
12. **Prove**