Course Code: 2MSCM4
Course: Complex Analysis-II
Credit: 4
Last Submission Date: October 31, (for January session)
April 30 (for July Session)

Max. Marks:-70
Min. Marks:-25

Note:-attempt all questions.

Que.1 Evaluate the residues of

$\frac{z^3}{(z-1)\ ^4(z-2)\ (z-3)}$ at the poles z = 1,2,3

Que.2 If f (z) is analytic within and on a closed contour C except at a finite number of poles and has no zero on C, then

$\frac{1}{2\pi i} \int_c \frac{f'(z)}{f(z)}$ dz = N-P

When N is the number of zeros and p is the number of poles inside c.

Que.3 State & prove Cauchy residue theorem.

Que.4 Prove that $\int_0^{2\pi} \frac{\cos 2\theta}{5+4cos\theta} = \frac{\pi}{6}$

Que.5 prove that $\int_0^{\infty} \frac{\cos mx}{a^2+x^2}$ dx = $\frac{\pi}{29}$ e^{-ma}

When m ≥ o , a > o

Que.6 If a>o, then prove that

$\int_0^{\infty} \frac{x \sin x}{x^{2+} a^2}$ dx = $\frac{\pi}{2} e^{-a}$

Que.7 To find all the bilinear transformation which maps the half plane f (z) ≥ 0 onto the unit circular disc 1w 1 ≤ 1.

Que.8 Show that the transformation w = $\frac{2z+3}{z-4}$ maps the circle $x^2 + y^2 -4x = 0$ onto the straight line 4u+3=0

Que.9 If f (z) = u + iv is an analytic function and z = $re^{i\theta}$, where u , v, r, θ are all real, then show that the Cauchy – Riemann equations are

$\frac{\partial u}{\partial r} = \frac{1}{r} \frac{\partial v}{\partial \theta}, \frac{\partial v}{\partial r} = - \frac{1}{r} \frac{\partial u}{\partial \theta}$

Que.10 If u = $(x-1)^3 - 3xy^2 + 3y^2$, determine v so that u+ iv is a regular function of x + i y.