



Reg. No. :

Name :

Fourth Semester B.Tech. Degree Examination, May 2013
(2008 Scheme)
08.401 : ENGINEERING MATHEMATICS – III (CMPUNERFHB)

Time : 3 Hours

Max. Marks : 100

Instructions : Answer **all** questions from Part – **A** and **one full** question from **each** Module of Part – **B**.

PART – A



1. Prove that the function e^{y+ix} is nowhere differentiable.
2. If u and v are harmonic functions prove that $\left(\frac{\partial u}{\partial y} - \frac{\partial v}{\partial x}\right) + i\left(\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y}\right)$ is analytic.
3. Prove that an analytic function with constant imaginary part is a constant.
4. Find the image of $|z - 3i| = 3$ under $w = \frac{1}{z}$.
5. By Cauchy's integral formula evaluate $\int_C \frac{\sin^2 z}{\left(z - \frac{\pi}{2}\right)^3} dz$ where c is $|z| = 2$.
6. Find the Taylor's series expansion of $\frac{1}{z^2}$ about $z = 2$. State the region of validity.
7. Find the poles and residues of $\frac{1 + e^z}{\sin z + z \cos z}$.



8. Find a positive root of $xe^x = 2$ by the method of false positions by performing 4 iterations.
9. Find a root of $x^3 - 2x - 5 = 0$ using Newton-Raphson method.
10. Evaluate $\int_0^6 \frac{dx}{1+x}$ using Trapezoidal rule by dividing the interval into 6 equal

parts.

(10×4=40 Marks)

PART - B

Module - 1

11. a) Show that $f(z) = \begin{cases} \frac{xy^2}{x^2 + y^2}, & z \neq 0 \\ 0, & z = 0 \end{cases}$ satisfy CR equations, but not differentiable at $z = 0$.

- b) Find the analytic function $f(z) = u + iv$ if $u - v = e^x (\cos y - \sin y)$.
- c) Determine the region of the w -plane into which the triangular region bounded by $x = 1$, $y = 1$ and $x + y = 1$ is mapped by $w = z^2$.
12. a) Show that $u(x, y) = x^2 - y^2$ and $v(x, y) = \frac{-y}{x^2 + y^2}$ are both harmonic, but $u + iv$ is not analytic.
- b) If the potential function is $\log(x^2 + y^2)$, find the flux function and the complex potential function.
- c) Find the bilinear transformation which maps the points $(2, i, -2)$ into the points $(1, i, -1)$.



Module – 2

13. a) Evaluate $\int_C |z| \bar{z} dz$ where C consists of the upper semicircle $|z| = 1$ and the segment $-1 \leq x \leq 1$.

b) Find the Laurent's series expansion of $\frac{z^2 - 1}{(z + 2)(z + 3)}$ in $|z| > 3$.

c) $I = \int_C \frac{\sin \pi z^2 + \cos \pi z^2}{(z - 1)^2(z - 2)} dz$, evaluate I using Cauchy's Residue theorem where C is $|z| = 3$.

14. a) Evaluate $\int_0^\pi \frac{d\theta}{(2 + \cos \theta)^2}$

b) Evaluate $\int_0^\infty \frac{dx}{1 + x^6}$

Module – 3

15. a) Solve the following system of equations by Gauss Seidal iteration method.

$28x + 4y - z = 32, x + 3y + 10z = 24, 2x + 17y + 4z = 35.$

b) The population of a town is as follows :

Year	x	1941	1951	1961	1971	1981	1991
Population in lakhs	y	20	24	29	36	46	51

Estimate the population increase during the period 1946 to 1976 by Newton's formula.

c) Using Lagrange's formula, fit a polynomial for the following data.

x :	1	2	7	8
y :	4	5	5	4

Find the value of y when x = 6.



16. a) The speeds of a train at various times are given below :

t (hr)	0	.5	1	1.5	2	2.5	3	3.5	4
v (in kmph)	0	13	33	39.5	40	40	36	15	0

Find the total distance covered using Simpson's method.

b) Solve by Euler's method $\frac{dy}{dx} = x + y^2$ and $y(0) = 0$. Find y approximately for $x = .5$ by taking $h = 0.1$.

c) Apply Runge-Kutta method of fourth order to find an approximate value of y

when $x = 0.7$, given that $\frac{dy}{dx} = y - x^2$ and $y(.6) = 1.7379$. **(20×3=60 Marks)**