



Reg. No. :

Name :

Fourth Semester B.Tech. Degree Examination, February 2015
(2008 Scheme)
08.401 : ENGINEERING MATHEMATICS – III (CMPUNERFHB)
(Special Supplementary)

Time : 3 Hours

Max. Marks : 100

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

PART – A

1. Show that $Suiz$ is analytic every where in the complex plane and find its derivative.
2. Examine whether $xy^2 + x^2y$ can be the real part of an analytic function.
3. If a function is analytic show that it is independent of \bar{z} .
4. Find the image of the half plane $x < c$ under the mapping $w = 1/z$.
5. Using Cauchy's integral formula evaluate $\int_c \frac{dz}{z^2+4}$ where c is the circle $|z - i| = 2$.
6. Expand $\frac{z-1}{z^2}$ as a Taylor series in powers of $z - 1$ and state the region of convergence.
7. Find the poles and residues of $\frac{suiz}{z^4}$.
8. Solve the equations by Gauss – Elimination method
 $2x + 3y - z = 5$
 $4x + 4y - 3z = 3$
 $2x - 3y + 2z = 2$





9. Fit a polynomial to the data

$$x: 0 \quad 1 \quad 3 \quad 4$$

$$y: -12 \quad 0 \quad 6 \quad 12$$

10. Use Trapezoidal rule to evaluate $\int_0^1 \frac{1}{1+x^2} dx$ with $h = 0.5$ and hence deduce an approximate value of π . (10×4=40 Marks)

PART - B

Module - I

11. a) Prove that the function $F(z) = \frac{x^3(1+i) - y^3(1-i)}{x^2 + y^2}$ when $z \neq 0$, $F(z) = 0$. When $z = 0$

is not analytic at $z = 0$ even though Cauchy-Riemann equations are satisfied at that point.

b) Construct the analytic function whose real part is

$$\sin x \cosh y + 2 \cos x \sinh y + x^2 - y^2 + 4xy.$$

c) Find the bilinear transformation which maps the points $z = 0, i, 2i$ into the points $w = 5i, \infty, \frac{i}{3}$.

12. a) Find the analytic function $F(z) = u + iv$ if $u + v = \frac{x}{x^2 + y^2}$ and $F(1) = 1$.

b) What is the image of the circle $|z| = c$ under the transformation $w = z + \frac{1}{z}$?

Discuss the case when $c = 1$.

c) If $F(z)$ is analytic, show that

$$\nabla^2 |F(z)|^2 = 4|F'(z)|^2$$



Module – II

13. a) Evaluate $\int_c |z|^2 dz$ where c is the rectangle with vertices $z = 0$, $z = 1$, $z = 1 + i$ and $z = i$.
- b) Obtain the Laurent's series expansion of the function $\frac{1}{z - z^3}$ in the region $1 < |z + 1| < 2$.
- c) Evaluate $\int_c \frac{z-2}{z(z-1)} dz$ where c is the circle $|z| = 2$ using Residue theorem.

14. a) Show that $\int_0^{2\pi} \frac{d\theta}{1+k \cos \theta} = \frac{2\pi}{\sqrt{1-k^2}}$ ($k^2 < 1$).

b) Evaluate $\int_0^{\infty} \frac{dx}{x^4 + 1}$.



Module – III

15. a) Find the root of $xe^x - 2 = 0$ which lies between 0 and 1 to four decimal places using the method of false position.
- b) Using Gauss Seidal method solve the following system of equations.

$$\begin{aligned} w - x + 3y - 3z &= 3 \\ 2w + 3x + y - 11z &= 1 \\ 5w - 2x + 5y - 4z &= 5 \\ 3w + 4x - 7y + 2z &= -7 \end{aligned}$$

- c) Estimate the value of $F(22)$ from the following table

x :	20	25	30	35	40	45
F(x) :	354	332	291	260	231	204



16. a) The following table gives the velocity 'v' of a particle at time 't'.

t (seconds)	0	2	4	6	8	10	12
v (metres/sec)	4	6	16	34	60	94	136

Using Simpson's method, find the distance moved by the particle in 12 seconds.

b) Find $y(.2)$ and $y(.3)$ by Taylor's series method if

$$y' + y = x^2, y(0) = 1$$

c) Solve $\frac{dy}{dx} = \frac{3x+y}{2}, y(0) = 1$ using Range-Kutta method of order 4 and find $y(.2)$.

(3×20=60 Marks)

