

I B. Tech I Semester Supplementary Examinations, May/June - 2017
MATHEMATICS-II
(Numerical Methods and Complex Variables)
 (Com. to ECE, EIE, E.Com.E)

Time: 3 hours

Max. Marks: 70

- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
 2. Answering the question in **Part-A** is Compulsory
 3. Answer any **FOUR** Questions from **Part-B**

PART -A

1. a) Give formula to find a reciprocal of a number using Newton-Raphson method. (2M)
- b) Define: (i) Averaging operator μ (ii) shift operator E. (2M)
- c) The value of $\int_1^2 \frac{dx}{x}$ by Simpson's $\frac{1^{rd}}{3}$ rule (taking $n = 4$) is ____ (2M)
- d) State orthogonality of legendre's polynomials. (2M)
- e) Using Cauchy's theorem evaluate $\int_C \frac{e^{2z}}{z-2} dz$ where C is $|z| = 1$. (2M)
- f) Determine the poles of the function $f(z) = \frac{z}{\cos z}$. (2M)
- g) Define Isolated singularity with example. (2M)

PART -B

2. a) Solve $x = 1 + \tan^{-1} x$ by iteration method. (7M)
- b) Using Newton Raphson method, find the root of the equation $f(x) = e^x - 3x$ that lies between 0 and 1. (7M)

3. a) Following are the measurements T made on a curve recorded by the oscillograph representing a change of current I due to a change in the conditions of an electric current (7M)

$T:$	1.2	2.0	2.5	3.0
$I:$	1.36	0.58	0.34	0.20

Using Lagrange's formula find I at $T = 1.6$.

- b) State appropriate interpolation formula which is to be used to calculate the value of $e^{1.75}$ from the data and hence evaluate it. (7M)

x	1.7	1.8	1.9	2.0
$y = e^x$	5.474	6.050	6.686	7.389

4. a) Evaluate $\int_0^1 \sqrt{1+x^3} dx$ taking $h = 0.1$ using Simpson's $\frac{1}{3}$ rule. (7M)
- b) Using Runge-Kutta method find $y(0.2)$ for the equation $\frac{dy}{dx} = \frac{y-x}{y+x}$, $y(0) = 1$ take $h = 0.2$. (7M)
5. a) Evaluate $\int_0^2 (8-x^3)^{1/3} dx$ using $\beta - \Gamma$ functions. (7M)
- b) Show that $(1-2xt+t^2)^{-1/2} = \sum_{n=0}^{\infty} P_n(x)t^n$. (7M)
6. a) Find the conjugate harmonic of $u = e^{x^2-y^2} \cos 2xy$. Hence find $f(z)$ in terms of z . (7M)
- b) Let C be closed contour described in the positive sense. (7M)
- Let $g(a) = \int_c \frac{z^3+2z}{(z-a)^3} dz$. Show that $g(a) = 6\pi ia$ if a is within c and $g(a) = 0$ when a is outside C .
7. a) Find the Laurent series of the function $f(Z) = \frac{z}{(z+1)(z+2)}$ about $z = -2$. (7M)
- b) Find the residue of $\int_c \frac{z^2}{1-z^4} dz$ at these singular points which lie inside the circle $|z| = 1.5$. (7M)