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 $\mathbf{F O U R}$ Questions from Part-B
PART -A

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

## PART - B

2. a) Solve $x=1+\tan ^{-1} x$ by iteration method.
b) Using Newton Raphson method, find the root of the equation $f(x)=e^{x}-3 x$ that lies between 0 and 1 .
3. a) Following are the measurements $T$ made on a curve recorded by the oscilograph representing a change of current I due to a change in the conditions of an electric current

| $T:$ | 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.

| $x$ | 1.7 | 1.8 | 1.9 | 2.0 |
| :---: | :---: | :---: | :---: | :---: |
| $y=e^{x}$ | 5.474 | 6.050 | 6.686 | 7.389 |

4. a) Evaluate $\int_{0}^{1} \sqrt{1+x^{3}} d x$ taking $h=0.1$ using Simpson's $\frac{1}{3}$ rd rule.
b) Using Runge-Kutta method find $y(0.2)$ for the equation $\frac{d y}{d x}=\frac{y-x}{y+x}, y(0)=1$ take $h=0.2$.
5. a) Evaluate $\int_{0}^{2}\left(8-x^{3}\right)^{1 / 3} d x$ using $\beta-\Gamma$ functions.
b) Show that $\left(1-2 x t+t^{2}\right)^{-1 / 2}=\sum_{n=0}^{\infty} P_{n}(x) t^{n}$.
6. a) Find the conjugate harmonic of $u=e^{x^{2}-y^{2}} \cos 2 x y$. Hence find $f(z)$ in terms of $z$.
b) Let $C$ be closed contour described in the positive sense.
$\operatorname{Let} g(a)=\int_{c} \frac{z^{3}+2 z}{(z-a)^{3}} d z$. Show that $g(a)=6 \pi i a$ if $a$ is with in $c$ 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 $Z=-2$.
b) Find the residue of $\int_{c} \frac{z^{2}}{1-z^{4}}$ dz at these singular points which lie inside the circle $|z|=1.5$.
