

Code No: RT21024

R13

SET - 1

II B. Tech I Semester Supplementary Examinations, Oct/Nov - 2017

COMPLEX VARIABLES AND STATISTICAL METHODS

(Electrical and Electronics Engineering)

Time: 3 hours

Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)

2. Answer **ALL** the question in **Part-A**

3. Answer any **THREE** Questions from **Part-B**

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**PART -A**

1. a) If  $f(z) = u(x,y)+iv(x,y)$  is analytic, then prove that  $u$  and  $v$  satisfies Laplace equation (4M)
- b) Evaluate  $\int_{(0,0)}^{(1,1)} [3x^2 + 5y + i(x^2 - y^2)]dz$  along  $y^2 = x$  (4M)
- c) Determine the residue of  $z/\cos z$  at  $z=0$  (3M)
- d) Find the Image of straight line  $x = c$  under the transformation  $w = 4/z$  (4M)
- e) If  $X$  is normally distributed with mean 30 and S.D 6 then find  $P(X > 17)$  (3M)
- f) What is the sample size with 98% confidence that the maximum error is at most 0.25 with S.D is 1.25 (4M)

**PART -B**

2. a) If  $f(z)$  is regular then prove that  $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)|f(z)|^2 = 4|f'(z)|^2$  (8M)
- b) Construct analytic function  $f(z)$ , whose imaginary part is  $v(x, y) = x^2 - y^2 + \frac{x}{x^2 + y^2}$  (8M)
3. a) Evaluate  $\int_C \frac{\cos z dz}{(z - \pi)}$ ,  $C$  being circle  $|z - 1| = 3$  by Cauchy's Integral formula (8M)
- b) Obtain Laurent's series expansion of  $\frac{1}{(z^2 - 4z + 3)}$  for  $1 < |z| < 3$  (8M)
4. a) Evaluate  $\int_{-\infty}^{\infty} \frac{\cos ax}{x^2 + 1} dx$  ( $a > 0$ ) using residue theorem (8M)
- b) Evaluate  $\int_0^{2\pi} \frac{\sin^2 \theta}{a + b \cos \theta} d\theta$  using residue theorem (8M)
5. a) Discuss the transformation  $w = z + 1/z$  (8M)
- b) Find the Bilinear transformation that maps  $z(-i, 0, i)$  onto  $w(-1, i, 1)$  (8M)

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6. From a population  $\{3,6,9,15,17\}$ , list of all possible samples of size 3 without replacement from the population hence calculate (16M)
- Mean of each samples listed by assigning each sample with probability  $1/10$
  - Verify  $E(\bar{x}) = \theta$ , where  $\theta$  is the mean of the population
  - Find variance of the population
  - Find the variance of mean of the samples
7. a) The mean life of 100 bulbs is 1560hrs with S.D of 90 hrs. Test the claim at 5% level that the mean life time of bulbs is 1580hrs (8M)
- b) Test whether the die was fair if it is thrown 120 times and observed the frequency as follows at 1% level (8M)

|           |    |    |    |    |    |    |
|-----------|----|----|----|----|----|----|
| Face No   | 1  | 2  | 3  | 4  | 5  | 6  |
| Frequency | 10 | 15 | 25 | 25 | 18 | 27 |