

Code No: RT21024

R13

SET - 1

II B. Tech I Semester Supplementary Examinations, May/June - 2016
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**

PART -A

1. a) Show that the complex variable function $f(z) = |z|^2$ is differentiable only at the origin.
 - b) Expand the following function in a Taylor's series $\frac{z-1}{z+1}$ about $z = 0$.
 - c) Determine the poles and residues at each pole of the function $f(z) = \cot z$
 - d) Find the image of following region in the z -plane onto the w -plane under the given mapping $|z| < 1, \text{Im } z > 0; w = z + (2 + i)$
 - e) For the discrete probability distribution, find the value of K
- | | | | | | | | | |
|------|---|---|----|----|----|----------------|-----------------|--------------------|
| x | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| f(x) | 0 | K | 2K | 2K | 3K | K ² | 2K ² | 7K ² +K |
- f) An automobile manufacturer asserts that the seat belts of his seats are 90% effective. A consumer group tests the seat belts on 50 cars and finds it effective on 37 of them. What is the test statistic to be used to test his hypothesis?

PART -B

2. a) (i) Show that the function $f(z) = \bar{z}$ is continuous everywhere but not differentiable at any point in the complex plane.
 (ii) Show that $f(z) = \bar{z}$ is not differentiable at $z = 0$ and is nowhere analytic.
- b) Find the analytic function $f(z) = u + iv$ given

$$u + v = \frac{2 \sin 2x}{e^{2y} + e^{-2y} - 2 \cos 2x}$$

3. a) State and prove Cauchy's integral formula and hence find the value of (i) $F(3.5)$ (ii) $F(i)$, if
 $F(a) = \int_c \frac{4z^2 + z + 5}{z - a} dz$ where c is the ellipse $\left(\frac{x}{2}\right)^2 + \left(\frac{y}{3}\right)^2 = 1$.
- b) Expand $f(z) = \frac{1}{z(z^2 - 3z + 2)}$ in the region $0 < |z| < 1$

4. a) State residue theorem and use it to evaluate
 $\int_c \frac{dz}{z^8(z+4)}$ where c is the circle (i) $|z|=2$ (ii) $|z+2|=3$
- b) Evaluate $\int_0^{2\pi} \frac{d\theta}{a + b \cos \theta}$; $a > |b| > 0$ and using it prove that $\int_0^\pi \frac{d\theta}{17 - 8 \cos \theta} = \frac{\pi}{15}$.



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5. a) Find the image of the triangle with vertices at i , $1 + i$, $1 - i$ in the z -plane under the transformation

$$w = e^{\frac{5\pi i}{3}} \cdot z - 2 + 4i$$

- b) Find the bilinear transformation which maps the points $z = 0, 1, i$ in the z -plane onto the points $1 + i, -i, 2 - i$ in the w -plane respectively.
6. a) Fit a normal distribution to the following data:
- | | | | | | |
|-----------|-------|-------|-------|-------|-------|
| Class | 60-62 | 63-65 | 66-68 | 69-71 | 72-74 |
| Frequency | 5 | 18 | 42 | 27 | 8 |
- b) A random sample of 100 mill workers at Kanpur showed their mean wage to be Rs. 3500 with a standard deviation of Rs. 280. Another random sample of 150 mill workers in Mumbai showed the mean wage to be Rs. 3900 with a standard deviation of Rs. 400. Do the mean wage of the workers in Mumbai and Kanpur differ significantly, at 5% level of significance?

7. a) Certain pesticides is packed into bags by a machine. A random sample of 10 bags is drawn and their contents are found to weigh in kgs as follows:

50, 49, 44, 52, 45, 48, 46, 45, 49, 45.

Test if the average picking can be taken as 50 kg.

- b) The following data presents the yields in quintals of common 10 subdivisions of equal area of two agricultural plots:

Plot1	6.2	5.7	6.5	6.0	6.3	5.8	5.7	6.0	6.0	5.8
Plot 2	5.6	5.9	5.6	5.7	5.8	5.7	6.0	5.5	5.7	5.5

Test whether the two samples taken from the two random populations have the same variance.

