

III B. Tech I Semester Regular/Supplementary Examinations, Oct/Nov - 2016

COMPLEX VARIABLE AND STATISTICAL METHODS

(Electrical and Electronics Engineering)

Time: 3 hours

Maximum Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)2. Answering the question in **Part-A** is compulsory3. Answer any **THREE** Questions from **Part-B**

PART -A

- 1 a) Derive the polar form of Cauchy Riemann equations. [4M]
- b) If $f(z) = \int_c \frac{3z^2 + 7z + 1}{z - e_z} dz$ where c is $|z|=2$, using Cauchy's integral formula, find $f'(1-i)$. [4M]
- c) Find the residue of the function $\frac{e^z}{(z-1)^2}$ at $z = 1$. [3M]
- d) Explain Errors of Sampling and Define Critical region. [4M]
- e) A random sample of size 100 is taken from a population with $\sigma = 5.1$. Given that the sample mean is $\bar{x} = 21.6$. Construct a 95% confidence interval for the population mean μ . [3M]
- f) Find the fixed points of the transformation $w = \frac{1+iz}{1-iz}$. [4M]

PART -B

- 2 a) Show that $f(z) = \begin{cases} \frac{x^3 y(y-ix)}{x^6 + y^2}, & z \neq 0 \\ 0, & z = 0 \end{cases}$ satisfies C-R equations at origin, but is not analytic at $z=0$. [10M]
- b) Show that the function $u = e^{-2xy} \sin(x^2 - y^2)$ is harmonic, find the function v and express $u+iv$ in terms of z . [6M]
- 3 a) Evaluate $\int_c \frac{e^z}{(z-1)(z+3)} dz$ where C is $|z|=3/2$ using Cauchy integral formula. [8M]
- b) Find the Laurent series expansion of the function $\frac{1}{(z^2+2)(z^2+1)}$ for $|z| > \sqrt{2}$. [8M]
- 4 a) Find the residue of $\frac{z^2}{z^4+1}$ at those poles lying inside the $|z|=2$. [6M]
- b) Evaluate $\int_0^{2\pi} \frac{(1+4\cos\theta)d\theta}{17+8\cos\theta}$ using Residue theorem. [10M]



- 5 a) Show that the function $w = 4/z$ transforms the straight line $x=c$ in the z -plane into a circle in the w -plane. [8M]
b) Find the bilinear transformation that maps the points $\infty, i, 0$ into the points $0, -i, \infty$. [8M]
- 6 a) 1000 students have written an examination. The mean of the marks is 35 and standard deviation is 5. Assuming the distribution to be normal, find how many students (i). got between 25 and 40 marks (ii). got more than 50 marks. [8M]
b) A population consists of 1, 7, 9, 13. Find all possible samples of size 2 drawn without replacement. Find (i) population standard deviation (ii) mean of the sampling distribution of sample means. [8M]
- 7 a) A machine puts out 9 imperfect articles in a sample of 200 articles. After the machine is overhauled, it puts out 5 imperfect articles in a sample of 700 articles. Test at 5% level of significance, whether the performance of the machine is improved? [8M]
b) In one sample of 25 observations, the sum of the squares of the deviations of the sample values from the sample mean was 205 and in the other sample of 32 observations, it was 314. Test whether the difference in variances is significant at 5% level. [8M]

