R13

SET - 1

II B. Tech I Semester Regular Examinations, Jan - 2015
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) Write Cauchy Riemann equations in polar form.

    b) Find 'a' and ' b' if f(z) = $\left(x^2 - 2xy + ay^2\right) + i(bx^2 - y^2 + 2xy)$ is analytic.

    c) Write the test statistic for the differences of means of two large samples.

    d) Expand $f(z) = \dfrac{e^{2z}}{(z-1)^3}$ about z =1.

    e) Determine the poles of tanz and find the residue at the simple poles

    f) Find the bilinear transformation whose fixed points are 1 and 1

    g) Three masses are measured as 62.34,20.84,35.97 kgs with standard deviation 0.54,0.21,0.46

    kgs. Find the mean and standard deviation of the sum of the masses.

    h) A sample size 10 was taken from population. Standard deviation of sample is 0.3. Find

    the maximum error with 99% confidence   (2M+3M+2M+3M+3M+3M+3M+3M)

PART-B

2. a) Find the Analytic function whose real part is $u(x, y) = \dfrac{\sin 2x}{\cosh 2y + \cos 2x}$.

    b) Show that the function f(z) = $z\bar{z}$ is differentiable but not analytic at origin.

3. a) Evaluate $\displaystyle\int_{c} \dfrac{ze^{2z}}{(z - \pi i)^3}dz$, where c is a circle of radius 4 with centre at origin, by Cauchy

    integral formula

    b) Obtain Laurent's expansion for $f(z) = \dfrac{1}{(z+2)^2(z+1)}$ in $|z| > 2$

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4. a) Evaluate $\int\limits_{0}^{2\pi}\dfrac{d\theta}{5+4\cos\theta}$

   b) Evaluate $\int\limits_{0}^{\infty}\dfrac{\cos ax\,dx}{(x^2+a^2)^2}$

5. a) Discuss the transformation $w = \cos z$.

   b) Find the Bilinear transformation which maps $z = -1,\ 0\,,1$ onto $w = 0,\ i,3i$.

6. a) A random sample of size 64 is a taken from normal population with mean 51.4 and S.D 6.8. What is the probability that the mean of samples will (i) exceed 52.9 (ii) less than 50.6 (iii) between 50.5 and 52.3.

   b) Find the 95% confidence limits for mean of the population from which sample was taken from 15,17,10,18,16,9,7,11,13,14.

7. a) A college management claims that 75% of all single women appointed for teaching job get married and quit the job in two years. Test this hypothesis at 5% level of significance if among 300 such teachers, 212 got married within 2 years and quit then jobs

   b) In a test given two groups of students, the marks obtained are as follows

First Group	18	20	36	50	49	36	34	49	41
Second group	29	28	26	35	30	44	46	--	--

   Examine the significant difference between the means of the marks of the two group at 5% level.

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PART-A

1. a) Define harmonic function and give an example

    b) If c is a simple closed curve then evaluate $\int_c (\sin 3z + z^4 + e^z)dz$

    c) Write test statistic for the differences of means of two small samples

    d) Find the residue of $f(z) = \dfrac{e^{2z}}{(z-1)^3}$ at z =1

    e) Determine the poles *of* $tan z$ and find the residue at simple pole

    f) Find the bilinear transformation whose fixed points are i and -i

    g) Define two types of Errors in sampling.

    h) A sample size 10 was taken from population with S.D of sample is 0.3. Find the maximum
       error with 99% confidence   (2M+3M+2M+3M+3M+3M+3M+3M)

PART-B

2. a) Find the Analytic function whose imaginary part is $v(x, y) = \dfrac{2\sin x \sin y}{\cosh 2y + \cos 2x}$

    b) Show that the unction f(z) = $\sqrt{|xy|}$ is not analytic at origin although CR equations are

      satisfied at the point

3. a) Evaluate $\int_c \dfrac{ze^{2z}}{(z-2)^3}dz$ where c is the circle with radius 3 by Cauchy integral formula

    b) Obtain Laurent's expansion for $f(z) = \dfrac{1}{(z+2)(z+1)}$ in $1 < |z| < 2$

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4. a) Evaluate $\int_0^{2\pi} \dfrac{d\theta}{5 - 4\sin\theta}$

   b) Evaluate $\int_0^{\infty} \dfrac{dx}{(x^6 + 1)}$

5. a) Discuss the transformation $w = \sin z$

   b) Find the Bilinear transformation which maps $z = \infty,\, i,\, 0$ onto $w = -1, -i,\, 1$

6. a) Show that Sample mean is the unbiased estimator of population mean

   b) A random sample of size 100 taken from normal population with mean 76 and S.D 16. What is the probability that the mean of samples will (i) exceed 78 (ii) less than 60 (iii) between 75 and 78.

7. a) The mean production of rice in a sample of 100 fields is 200 lb per acre with S.D of 10 lb. Another sample of 150 fields gives the mean 220 lb and S.D 11 lb. Find if the two results are consistent at 1% level.

   b) The nine items of the sample had the following values: 45,47,50,52,48,47,49,53, and 51. Does the mean of nine items differ significantly from the population mean of 45.57 at 1% level.

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PART-A

1. a) Find the invariant points of $w = \dfrac{1+z}{1-z}$.

   b) Find the Harmonic conjugate of $\log\sqrt{x^2 + y^2}$.

   c) Evaluate $\displaystyle\int_c \dfrac{dz}{z-3}, where\ c : |z - 2| = 5$.

   d) Find the residue of $f(z) = \dfrac{e^{2z}}{(z-2)^2}$ at z =2.

   e) Determine and classify the singular point of f(z) = $z^2 \sin\left(\dfrac{1}{z}\right)$.

   f) Write any three characteristics of Normal Distribution.

   g) Define Hypothesis, Critical region and Standard error.

   h) If we can assert 95% that maximum error is 0.05 and p =0.2 find the sample size.

   (2M+3M+2M+3M+3M+3M+3M+3M)

PART-B

2. a) Find the Analytic function given that $v + u = \dfrac{\sin 2x}{\cosh 2y - \cos 2x}$.

   b) Show that the unction f(z) = $\dfrac{x^3 y(y - ix)}{x^6 + y^2}$ is not analytic at origin although CR equations are

   satisfied at the point.

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3. a) Evaluate $\int_c \dfrac{e^z}{(z^2+1)}dz$ where c is the unit circle by Cauchy integral formula

 b) Obtain Laurent's expansion for $f(z) = \dfrac{1}{(z+2)(z+1)^2}$ in $|z| < 1$

4. a) Evaluate $\int_0^{2\pi} \dfrac{d\theta}{3 - 2\sin\theta}$.

 b) Evaluate $\int_0^{\infty} \dfrac{dx}{(x^4+1)}$.

5. a) Discuss the transformation $w = z^2$.

 b) Find the Bilinear transformation which maps $z = \infty, i, 0$ on to $w = 0, i, \infty$.

6. a) Show that Sample variance is not the unbiased estimator of population variance

 b) A random sample of size 36 is taken from normal population with mean 155 and S.D 15. What is the probability that the mean of samples will (i) exceed 157 (ii) less than 160 (iii) between 155 and 158.

7. a) A sample of 450 items is taken from a population with mean 30 and S.D 20. Test whether the sample has come from the population with mean 29. Also calculate 95% confidence limits of the population mean.

 b) Two samples are drawn from two normal populations from the following data, test whether the two samples have the same variance at 5% level.

Sample I	60	65	71	74	76	82	85	87	--	--
Sample II	61	66	67	85	78	63	85	86	88	91

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4. Probability tables Normal, t, F and chi square tables are required

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PART-A

1. a) Find the invariant points of $w = \dfrac{1}{z - 2i}$.

    b) Find the Harmonic conjugate of $x^2 - y^2 + xy$.

    c) Evaluate $\int_c \dfrac{3dz}{z+1}, where\ c : |z| = 2$.

    d) Evaluate $\int_c ze^{\frac{1}{z}} dz$ where c is the unit circle by residue theorem.

    e) Determine and classify the singular point of $f(z) = \sin\left(\dfrac{1}{z}\right)$.

    f) Write any three characteristics of chi square Distribution.

    g) Write the test statistic for testing the equality of two population means for small samples and large samples.

    h) What is the maximum error one can expect to make with the probability 0.90, when using the mean of random sample 64 to estimate population mean with $\sigma = 1.6$

                                                               (2M+3M+2M+3M+3M+3M+3M+3M)

PART-B

2. a) Find the Analytic function given that $v + u = \dfrac{2\sin 2x}{e^{2y} + e^{-2y} - 2\cos 2x}$.

    b) Prove that an analytic function with constant real part is constant.

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3. a) Evaluate $\int_c \dfrac{ze^z}{(z-a)^3}dz$ where the point 'a' lies within the closed curve c by Cauchy integral formula.

b) Obtain Laurent's expansion for $f(z) = \dfrac{1}{(z+2)(z+1)^2}$ in $|z+1| > 1$

4. a) Evaluate $\displaystyle\int_0^{2\pi} \dfrac{d\theta}{3+2\cos\theta}$.

b) Evaluate $\displaystyle\int_0^{\infty} \dfrac{x^2 dx}{(x^2+1)^2}$.

5. a) Discuss the transformation $w = e^z$.

b) Find the Bilinear transformation which maps z = 1, i, -1 onto w = i, 0,-i.

6. a) Write a short note on properties of Estimators.

b) A random sample of size 50 is taken from normal population with mean 55 and S.D 15. What is the probability that the mean of samples will i) exceed 57 ii) less than 60   (iii) between 53 and 58

7. a) A college management claims that 80% of all single women appointed for teaching job get married and quit he job within two years of time. Test this hypothesis at 5% level of significance if among 200 such teachers, 112 got married within two years and quit their jobs.

b) Two investigations study the income of group of persons by the method of sampling. Following results were obtained

Investigator	Poor	Middle	Well
A	160	30	10
B	140	120	40

Show that the sampling technique of at least one of the investigators is suspected at 5% level.

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