Code No: R31021 **R10** **Set No: 1**

III B.Tech. I Semester Supplementary Examinations, May - 2013

COMPLEX VARABLEDS AND STATISTICAL METHODS

(Electrical and Electronic Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

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1. a) If $f(z)$ is analytic function then prove that $\left(\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right)|\text{Re } f(z)|^2 = 2|f'(z)|^2$.

   b) Find the analytic function $f(z)=u+iv$ if $u=a(1+\cos\theta)$.

2. a) State Cauchy's integral formula. Also evaluate $\int_C \frac{z}{z^2+1}dz$, where $C:\left|z+\frac{1}{z}\right|=2$.

   b) Find the Laurent's series of $f(z)=\frac{7z-2}{(z+1)z(z-2)}$ in the annulus $1<|z+1|<3$.

3. a) Evaluate $\int_0^{2\pi} \frac{1}{(5-3\sin\theta)^2}d\theta$ using Residue theorem.

   b) Evaluate $\int_C \frac{e^z}{(z^2+\pi^2)^2}dz$, where $C:|z|=4$.

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

   b) Show that the transformation $w=\frac{2z+3}{z-4}$ changes the circle $x^2+y^2-4x=0$ into the straight line $4u+3=0$.

5. a) Six cards are drawn from a well-shuffled pack of 52 cards, then find the probability that (i) at least 3 are diamonds (ii) none is a diamond.
   b) In a normal distribution exactly 7% of the items are under 35 and 89% are under 63. What are the mean and standard deviation of the distribution?

6. a) Define sampling distribution. A random sample of size 81 is taken from an infinite population having the mean 65 and standard deviation 10. What is the probability that the mean will be between 66 and 68?
   b) A random sample of 500 apples was taken from a large consignment and 60 were found to be defective. Find the 98% confidence limits for the percentage number of defective apples in the consignment.

Code No: R31021 **R10** **Set No: 1**

7. a) A manufacturer of electric bulbs claims that the percentage of defectives in his product does not exceed 6. A sample of 40 bulbs is found to contain 5 defectives. Would you consider the claim justified?
   b) A random sample of 400 flower stems has an average length of 15 cm. Can this be regarded as a sample from a large population with mean 16 cm and SD 5 cm?

8. a) A machine is designed to produce insulating washers for electrical devices of average thickness of 0.025 cm. A random sample of 10 washers was found to have a mean thickness of 0.024 cm. with a standard deviation of 0.002 cm. Test the significance of the deviation at 5% level.

   b) In an investigation on the machine performance, the following results are obtained.

Machine	No. of units inspected	No. of units defectives
Machine 1	375	17
Machine 2	450	22

Test whether there is any significant performance of two machines at $\alpha = 0.05$.

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Code No: R31021 **R10** **Set No: 2**

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(Electrical and Electronic Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions
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1. a) Show that the function $f(z)=\sqrt{|xy|}$ is not analytic at the origin, although Cauchy Riemann equations are satisfied at that point.
   b) Find the conjugate harmonic of $u=e^{x^2-y^2}\cos 2xy$. Hence find $f(z)$ in terms of z.

2. a) Evaluate $\int_C \frac{z+1}{z^2+2z+4}dz$, where $C:|z+1+i|=2$ by Cauchy's integral formula.
   b) Express $f(z)=\frac{z}{(z-1)(z-3)}$ in series of positive and negative powers of $(z-1)$.

3. a) Evaluate $\int_C \frac{12z-7}{(2z+3)(z-1)^2}dz$, where $C: x^2+y^2=4$.
   b) Evaluate $\int_0^{\pi} \frac{\cos 2\theta}{5+4\cos\theta}d\theta$ using Residue theorem.

4. a) Find the image of the domain in the z-plane to the left of the line $x=-3$ under the transformation $w=z^2$.
   b) Find the bilinear transformation which maps the points 1, i, -1 in to the points 2, i, -2.

5. a) Ten coins are thrown simultaneously. Find the probability of getting atleast seven heads.
   b) The marks obtained in statistics examination are found to be normally distributed. If 15% of students are ≥ 60 marks, 40% of the students < 30 marks, . Find the mean and standard deviation of the marks.

6. a) A random sample of size 25 from a normal population has the mean $\bar{x}=47.5$ and the standard deviation $s=8.4$. Does this information tend to support or refuse the claim that the mean of the population is $\mu=42.1$.
   b) What do you mean by an estimator?. Explain the properties of a good estimator.

Code No: R31021 **R10** **Set No: 2**

7. a) A die is thrown 256 times. An even digit turns up 150 times, can we say that the die is unbiased.
   b) In a city *A*, 20% of a random sample of 900 school boys has a certain slight physical defect. In another city *B*, 18.5% of a random sample of 1600 school boys had the same defect. Is the difference between the proportions significant at 0.05 level of significance?

8. a) The lifetime of electric bulbs for a random sample of 10 from a large consignment gave the following data.

Item	1	2	3	4	5	6	7	8	9	10
Life in 000 hrs.	4.2	4.6	3.9	4.1	5.2	3.8	3.9	4.3	4.4	5.6

Can we accept the hypothesis that the average lifetime of bulbs is 4000 hrs.

b) The measurements of the output of two units have given the following results. Assuming that both samples have been obtained from the normal populations at 5% significant level, test whether the two populations have the same variance.

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Code No: R31021 **R10** **Set No: 3**

III B.Tech. I Semester Supplementary Examinations, May - 2013

COMPLEX VARABLEDS AND STATISTICAL METHODS

(Electrical and Electronic Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks
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1. a) If $f(z)$ is analytic function then show that $\left(\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right)\log|f'(z)|=0.$

   b) Find the analytic function $f(z)=u(r,\ \theta)+iv(r,\ \theta)$ such that $u(r,\ \theta)=r^2\cos 2\theta - r\cos\theta+2.$

2. a) State Cauchy's integral formula and using it evaluate $\int_C \frac{\cos \pi z^2}{(z-1)(z-2)^2}dz,$ where $C:|z|=3.$

   b) Expand $f(z)=\frac{1}{z^2-3z+2}$ in the region $0<|z-1|<2.$

3. a) Evaluate $\int_C \frac{1}{\sinh z}dz,$ where $C:|z|=4.$

   b) Evaluate $\int_0^{2\pi}\frac{\sin 3\theta}{5-3\cos\theta}d\theta$ using Residue theorem.

4. a) Discuss about the transformation $w=\cos z.$
   b) Find the bilinear transformation which maps the points 0, 1, ∞ in the z-plane into −5, −1, 3 respectively in the w-plane. What are the invariant points in this transformation.

5. a) State and prove Baye's theorem.
   b) In a normal distribution 31% of the items are 45 and 8% are over 64. Find the mean and standard deviation of the distribution.

6. a) A research worker wishes to estimate mean of a population by using sufficiently large sample. The probability is 95% that sample mean will not differ from the true by more than 25% of the standard deviation. How large a sample should be taken?

   b) Among 900 people in a state 90 are found to be chapathi eaters. Construct 99% confidence interval in the true proportion?

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Code No: R31021 **R10** **Set No: 3**

7. a) A coin is tossed 960 times and head turned up 183 times. Is the coin unbiased?
   b) A sample poll of 300 voters from district *A* and 200 voters from district *B* showed that 56% and 48% respectively, were in favor of a given candidate. At 0.05 level of significance, test the hypothesis that there is a difference between districts.

8. a)The lifetime of electric bulbs for a random sample of 10 from a large consignment gave the following data.

Item	1	2	3	4	5	6	7	8	9	10
Life in 000 hrs.	4.2	4.6	3.9	4.1	5.2	3.8	3.9	4.3	4.4	5.6

Can we accept the hypothesis that the average lifetime of bulbs is 4000 hrs.

b) Pair of dice are thrown 360 times and the frequency of each sum is indicated below.

Sum	2	3	4	5	6	7	8	9	10	11	12
Frequency	8	24	35	37	44	65	51	42	26	14	14

Would you say that the dice are fair on the basis of the chi-square test at 0.05 level of significance.

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Code No: R31021 **R10** **Set No: 4**

III B.Tech. I Semester Supplementary Examinations, May - 2013

COMPLEX VARABLEDS AND STATISTICAL METHODS

(Electrical and Electronic Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks
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1. a) If $f(z)$ is a regular function of z then prove that $\left(\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right)|f(z)|^2 = 4|f'(z)|^2$.

   b)Show that $u(x, y) = e^{2x}(x\cos 2y - y\sin 2y)$ is harmonic and find its harmonic conjugate.

2. a)Using Cauchy's integral formula, evaluate $\int_C \frac{\cosh \pi z}{z(z^2+1)}dz$, where $C: |z| = 2$.

   b) Expand $\frac{e^{2z}}{(z-1)^3}$ about $z = 1$ as a Laurent's series. Also find the region of convergence.

3. a) Find the poles and residues at each pole of $\tanh z$.

   b) Using the Residue theorem, evaluate $\int_C \frac{ze^z}{(z^2+9)}dz$, where $C: |z| = 5$. using Residue theorem.

4. a) If $w = \frac{1+iz}{1-iz}$ then find the image of $|z| < 1$.

   b) Find the bilinear transformation which maps the points 0, 1, ∞ in the z-plane into -5, -1, 3 respectively in the w-plane. What are the invariant points in this transformation.

5. a) Six dice are thrown 243 times. How many times do you expect at least tow dice to show 5 or 6.

   b) Suppose 10% of the probability for a normal distribution $N(\mu, \sigma^2)$ is below 35 and 5% above 90. What are the values of μ and σ.?

6. a) A normal population has a mean of 0.1 and standard deviation of 2.1. Find the probability that mean of a sample of size 900 will be negative.

   b) If the mean breaking strength of copper wire is 505 Lbs with a standard deviation of 15 Lbs. the sample is 49. Construct 95% confidence interval for the mean.

Code No: R31021 **R10** **Set No: 4**

7. a) A die is thrown 960 times and it falls with 5 upwards 184 times. Is the die unbiased at a level of significance of 0.01.
   b) A random sample of 400 flower stems has an average length of 15 cm. Can this be regarded as a sample from a large population with mean 16 cm and SD 5 cm.

8. a) A random sample of size 25 from a normal population has the mean 47.5 and the standard deviation 8.4. Does this information support or refute the claim that the mean of the population is $\mu = 42.5$?

   b) The measurements of the output of two units have given the following results. Assuming that both samples have been obtained from the normal populations at 5% significant level, test whether the two populations have the same variance.

Unit *A*:	14.1	10.1	14.7	13.7	14.0
Unit *B*:	14.0	14.5	13.7	12.7	14.1

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