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

III B.Tech. I Semester Regular Examinations, November/December - 2012

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) Show that $f(z) = |z|^2$ is not analytic.
   (b) Find the analytic function $f(z) = u(r,\theta) + iv(r,\theta)$ such that

$$v(r,\theta) = \left(r - \frac{1}{r}\right)\sin\theta, \neq 0$$

2. (a) State and Prove Cauchy's integral theorem?
   (b) Evaluate $\int \frac{z\, e^z dz}{(z+2)^3}$ where c is |z|=3 using Cauchy's integral formula?

3. (a) Find the poles and residues at each pole of $f(z) = \frac{\sin^2 z}{(z-\pi/6)^2}$

   (b) Evaluate the following by contour applying the calculus of residues. $\int_0^{2\pi} \frac{d\theta}{5 - 3\cos\theta}$

4. (a) Find the image of the circle |z| = 2, under the transformation w = z + 3 + 2i.
   (b) Prove that under the transformation $w = \frac{1}{z}$, the image of the lines y=x-1 and y=0 are the circle $u^2 + v^2 - u - v = 0$ and the line v=0 respectively.

5. (a) A can hit a target 3 times in 5 shots, B hits target 2 times in 5 shots, C hits target 3 times in 4 shots. Find the probability of the target being hit when all of them try.
   (b) Fit a Poisson distribution for the following data and calculate the expected frequencies

X	0	1	2	3	4
F(x)	109	65	22	3	1

6. (a) The mean life time of light bulbs produced by company is 1500 hours and S,D of 150 hours.Find the probability that lighting will take place for (a) at least 5000 h. (b) at most 4200h if three bulbs are connected such that when one bulb burns out, another bulb will go on. Assume that life times are normally distributed.
   (b) Write a short note on interval estimation and Bayesian estimation.'

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7. (a) A sample of 400 items is taken from a population whose standard deviation is 10. The mean of the sample is 40. Test whether the sample has come from a population with mean 38.Also calculate 95% confidence interval for the population.
   (b) In a sample of 600 students of a certain college 400 are found to use ball pens. In another
   college, from a sample of 900 students 450 were found to use ball pens. Test whether the two colleges are significantly different with respect to the habit of using ball pens.

8. (a) The heights of 10 males of a given locality are found to be 70, 67, 62, 61, 68, 70 ,64, 66 inches.Is it reasonable to believe that the average height is greater than 64 inches? Test at 5% significance level assuming that for 9 degrees of freedom (t= 1.833 at α =0.05).
   (b) The nicotine contents in milligrams in two samples of tobacco were found to be as follows.

Sample A	24	27	26	21	25	
Sample B	27	30	28	31	22	36

Can it be said that the two samples have come from the same normal population?

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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 f(z)= cos z is analytic everywhere in the complex plane and find f'(z).

   (b) If $f(z) = u + iv + \frac{1}{z}$, show that the curves $u(x, y) = c_1 and\ v(x, y) = c_2$ intersect orthogonally.

2. State and Prove Cauchy's Integral formula. Find f(2) and f(3) if f(a) = $\int_c \frac{(2z^2 - z - 2}{z - a} dz$ where c is the circle |z|= 2.5 using Cauchy's integral formula.

3. (a) Find the poles and residues at each pole of $\frac{2z+1}{1-z^4}$

   (b) Evaluate the following by contour applying the calculus of residues.

   $\int_0^{2\pi} \frac{d\theta}{1 - 2p\sin\theta + p^2}$

4. (a) Find the image of the rectangle R:-π<x<π, $\frac{1}{2}$ <y<1 under the transformation w =sinz.

   (b) Find the angle of rotation at the point z =z+1 when the transformation is w =z^2. Also find r of the transformation at that point.

5. (a) Companies B_1,B_2,B_3 produce 30%,45% and 25% of the cars respectively. It is known that 2%, 3% and 2% of the cars produced from B_1,B_2,and B_3 are defective. If a car purchased is found to be defective what is the probability that this car is produced by company B_3?

   (b) Fit a normal distribution to the following distribution:

Class	5-9	10-14	15-19	20-24	25-29	30-34	35-39
F	1	10	37	36	13	2	1

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6. (a) A normal population has a mean of 0.1 and standard deviation of 2.1Find the probability that men of sample of size 900 will be negative.
(b) Using the mean of a random sample of size 150 to estimate the man mechanical aptitude of mechanics of a large workshop and assuming $\sigma = 6.2$ what can we assert with 0.99 probability about the maximum size of the error.

7. (a) The mean life of a sample of 10 electric bulbs was found to be 1456 hours with S.D of 423 hours. A second sample of 17 bulbs chose from a different batch shoed a mean life of 1280 hours with S.D. of 398 hours. Is there a significant difference between the means of two batches?
(b) In a city 250 men out of 750 were found to be smokers. Does this information support the conclusion that the majority of men in this city are smokers?

8. (a) The heights of 10 males of a given locality are found to be 70, 67,62,61,68,70,64,66 inches. Is it reasonable to believe that the average height is greater than 64 inches? Test at 5% significance level assuming that for 9 degrees of freedom (t= 1.833 at α =0.05).
(b) The following table gives the number of units of production per day turned out by four different types of machines.

Employee	Type of Machines			
	M1	M2	M3	M4
E1	43	39	9	35
E2	41	44	53	45
E3	39	34	52	38
E4	49	51	56	48

Using ANOVA

(i) Test the hypothesis that the mean production is the same for the four machines.
(ii) Test the hypothesis that the employees do not differ with respect to mean productivity

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

III B.Tech. I Semester Regular Examinations, November/December - 2012

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) Show that the function $u = \frac{1}{2}\log(x^2 + y^2)$ is harmonic and find its conjugate.

   (b) Find the regular function whose imaginary part is $e^{-x}(x\cos y + y\sin y)$

2. (a) Evaluate $\int_c \frac{e^{3z}dz}{(z^3 - 4z)}$ where c is |z+2|=3/2 using Cauchy's integral formula.

   (b) Expand the Laurent series of $\frac{z^2 - 1}{(z+2)(z+3)}$, $for\ |z| > 3$.

3. (a) Find the poles and residues at each pole of tan hz

   (b) Evaluate the following by contour applying the calculus of residues. $\int_0^{2\pi} \frac{\cos 3\theta}{5 - 3\cos\theta} d\theta$

4. (a) Show that the transformation $w = \frac{1}{z}$ maps a circle to a circle or to a straight line if the former goes through the origin.

   (b) Prove that under the transformation $w = \frac{1}{z}$, the image of the lines y=x-1 and y=0 are the circle $u^2 + v^2 - u - v = 0$ and the line v=0 respectively

5. (a) The probabilities that students A, B, C, D solve a problem are $\frac{1}{3}, \frac{2}{5}, \frac{1}{5}$, and $\frac{1}{4}$ respectively.If all of them try to solve the problem, what is the probability that the problem is solved.

   (b)Fit a Poisson distribution for the following data and calculate the expected frequencies

X	0	1	2	3	4
F(x)	109	65	22	3	1

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6. (a) 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.
(b) Construct a 99% confidence interval for the true mean weight loss if 16 persons on diet control after one month had a mean weight loss of 3.42 kgs with S.d of 0.68 kgs.

7. (a) A coin was tossed 400 times and returned heads 216 times. Test the hypothesis that the coin is unbiased. Use a 0.05 Level of significance.
(b) In two large populations, there are 30%, and 25% respectively of fair haired people. Is this difference likely to be hidden in samples of 1200 and 900 respectively from the two populations?

8. (a) Memory capacity of 10 students were tested before and after training. State whether the training was effective or not from the following scores.

Before staining	12	14	11	8	7	10	3	0	5	6
After training	15	16	10	7	5	12	10	2	3	8

(b) The following table gives the number of refrigerators sold by 4 salesmen of Kelvinator (India) Ltd, in three months: May, June, July

Month	A	B	C	D
May	50	40	48	39
June	46	48	50	45
July	39	44	40	39

Using ANOVA, test the hypothesis that mean sales is the same for three months.
(or is there a significant difference in the sales made by the four salesmen ?)

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

III B.Tech. I Semester Regular Examinations, November/December - 2012

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) Show that the function $e^z(zosy + i\sin y)$ is holomorphic (analytic) and find its derivative.

   (b) Determine the analytic function whose real part is $e^{2x}(x\cos 2y - y\sin 2y)$

2. (a) Evaluate $\int_C \frac{e^z \sin 2z - 1}{z^2(z+2)^2} dz$ where C is |z|=$\frac{1}{2}$ using Cauchy's integral formula

   (b) Find the Laurent series of the function $f(z) = \frac{z}{(z+1)(z+2)}$ *about* $z = -2$

3. (a) Find the residue of

$$f(z) = \frac{z^3}{(z-1)^4(z-2)(z-3)} \text{ at } z = 1$$

   (b) Use method of contour integration to evaluate $\int_{-\infty}^{\infty} \frac{x^2}{(x^2+a^2)^3} dx$

4. (a) Show that the function w =$\frac{4}{z}$ transforms the straight line x=c in the z-plane into a circle in the w –plane.

   (b) Find the bilinear transformation which maps the points (-1, 0, 1) into the points (0, i, 3i).

5. (a) A,B,C, are aiming to shoot a balloon. A will succeed 4 times out of 5 attempts. The chance of B to shoot the balloon is 3 out of 4 and that C is 2 out of 3. If the three aim the balloon simultaneously, then find the probability that at least two of them hit the balloon.

   (b) Fit a poisson distribution for the following data and calculate the expected frequencies

X	0	1	2	3	4	5	6	7	8
F	56	156	132	92	37	22	4	0	1

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6. (a) Determine the probability that the sample mean area. Covered by the sample of 40 of 1 liter paint boxes will be between 510 and 520 square feet, given that a 1 liter of such paint box covers on the average 513.3 square feet with S.D of 31.5 sft.
   (b) In how many ways the estimation can be done and what are they? Explain in detail.

7. (a) A die was thrown 9000 times and of these 3220 yielded a 3 or 4 .Is this consistent with the hypothesis that the die was unbiased? (Use α=0.01) as level of significance)
   (b) Write short notes on Type – I and Type-II errors

8. (a) To compare two kinds of bumper guards.6 of each kind were mounted on a car and then the car was run into a concrete wall .T he following are the costs of repairs

Guard 1	107	148	123	165	102	119
Guard 2	134	115	112	151	133	129

   (b) Three samples, each of size 5, were drawn from three uncorrelated normal populations with equal variances. Test the hypothesis that the population means are equal at 5% level.

Sample 1	10	12	9	16	13
Sample 2	9	7	12	11	11
Sample 3	14	11	15	14	16

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