

PART – A Questions

1. Write the Cauchy Reimann equation in polar coordinates.
2. If the transformation $w=f(z)$ is called fixed points then _____.
3. State Cauchy Integral theorem.
4. If $z = a$ is an isolated singularity of $f(z)$ and has an infinite number of Laurent's terms then it is _____.
5. The moment of coefficient of skewness is defined as _____.
6. State Binomial distribution.
7. Define standard error.
8. The test statistic of F distribution is _____.
9. Find $Z\{(-1)^n\}$.
10. State whether True/False:
11. " If $z[f(t)] = F(z)$ then $z[e^{-at} f(t)] = F[ze^{-aT}]$
12. Prove that $w = z^2$ is analytic
13. Give an example such that u and v are harmonic but $u + iv$ is not analytic.
14. Evaluate $\int_C \frac{dz}{z+4}$ where C is the circle $|z| = 2$.
15. State Cauchy's residue theorem.
16. Find the mean of Poisson Distribution.
17. What are regression lines?
18. Define Critical region.
19. t and F tests are used only for _____
20. Find the Z-transform of $(n + 1)(n + 2)$.
21. State the final value theorem in Z-transform.
22. If $w = f(z) = u(x,y) + iv(x,y)$ is analytic, write down the results for $f'(z)$.
23. In the bilinear transformation $w = \frac{az+b}{cz+d}$, what is the necessity for the condition $ad - bc \neq 0$?
24. Find the singular points of $f(z) = \frac{z^2 - 1}{z^2 + 4}$.
25. State Cauchy's residue theorem.
26. Define correlation.
27. Comment on the following: For a binomial distribution mean = 7 and variance = 11.
28. What do you mean by level of significance?
29. State the assumptions made for student's t - test.
30. Find the z-transform of $n+2$.
31. State the convolution property of z -transform.
32. State the sufficient conditions for the function $f(z) = u + iv$ to be analytic.

33. How many independent conditions are required to determine a bilinear transformation?
34. State Cauchy's theorem.
35. Expand $\frac{1}{z-2}$ at $z = 1$ as a Taylor series.
36. Define Kurtosis.
37. Comment on the following:
- For a binomial distribution, mean is 15 and its standard deviation is 5.
38. Define null hypothesis.
39. Mention two uses of χ^2 - test.
40. Find the Z-transform of a^n .
41. State the convolution property of z- transform
42. If $f(z)$ is an analytic function with constant modulus, then $f(z)$ should be _____.
43. Under the transformation $w = \frac{1}{z}$, in general, the straight lines of the z - plane are mapped onto _____ of the w - plane.
44. If $f(z)$ is analytic function of z and if $f(z)$ is continuous at each point within and on a closed curve C , then $\int_C z dz$ _____.
45. Define isolated singularity.
46. The square root of the product of two regression coefficients gives the value of _____ coefficient.
47. Poisson distribution is the limiting case of _____ distribution.
48. Define null hypothesis.
49. Define level of significance.
50. Define Z - Transform.
51. Inverse Z - Transform of $\frac{1}{z-1}$ is _____.
52. Define an analytic function.
53. Define invariant points of a bilinear transformation.
54. State Cauchy's integral theorem.
55. Find the poles of $f(z) = \frac{z-3}{z^2+2z+5}$.
56. Write Spearman's rank correlation formula.
57. State the mean and variance of the Poisson distribution.
58. Define Type I error in the testing of hypothesis.
59. Define level of significance.
60. Define Z - transform of a sequence $\{u_n\}$.
61. Fill in the blank: $Z(na^n) =$ _____.
62. Write the Cauchy Riemann equations.
63. $\frac{\partial^2 \phi}{\partial x^2} - \frac{\partial^2 \phi}{\partial y^2} = 0$ is known as Laplace Equation. (True/False)
64. State Cauchy's integral theorem.

65. Define Removable singularity.
66. Write the mean and variance of Poisson distribution.
67. Correlation coefficient lies between -1 and $+1$. (True/False)
68. Define Null hypothesis.
69. Define producers' risk.
70. Find $z(a^n)$.
71. State shifting theorem in Z-transform.

PART -B Questions

1. Prove that the function $u = x^3 - 3xy^2 + 3x^2 - 3y^2 + 1$ is harmonic.

2. Find the residue of $f(z) = \frac{z^2}{(z-1)^2(z+2)}$ at each of its poles.

3. The ranking of ten students in two subjects A and B are as follows:

A :	3	5	8	4	7	10	2	1	6	9
B :	6	4	9	8	1	2	3	10	5	7

4. If mean height and standard deviation of height of 200 students of a college are 176.65 and 3.28 respectively, what is the confidence interval of mean height?

5. Find $z[e^t \sin 2t]$

6. Show that an analytic function with constant real part is constant.

7. Obtain the residues of the function $f(z) = \frac{z-3}{(z+1)(z+2)}$ at its poles.

8. Calculate the coefficient of correlation from the following data:

X:	9	8	7	6	5	4	3	2	1
Y:	15	16	14	13	11	12	10	8	9

9. In one sample of 8 observations the sum of the squares of deviations of the sample values from the sample mean was 84.4 and in the other sample of 10 observations it was 102.6. Test whether this difference is significant at 5% level.

10. Find the Z-transform of $\frac{1}{(n+1)(n+2)}$.

11. Show that an analytic function with constant argument is constant.



12. Evaluate $\int_C \frac{dz}{z^2 e^z}$ where C is $|z| = 1$ using Cauchy's integral formula.
13. In a normal distribution 31% of the items are under 45 and 8% are over 64. Find the mean and standard deviation of the distribution.
14. The means of two simple samples of 1000 and 2000 are 67.5 inches and 68.0 inches respectively. Can the samples be regarded as drawn from the same population of standard deviation 2.5 inches? (Test at 5% level of significance).
15. Prove that $Z\{nx(n)\} = -z \frac{d}{dz} X(z)$, where $X(z) = Z\{x(n)\}$.
16. Show that an analytic function with constant modulus is constant.
17. Evaluate $\int_C \frac{5z^2 - 3z + 2}{(z-1)^3} dz$ where C is any simple closed curve enclosing $z = 1$.
18. In a town 10 accidents took place in a span of 50 days. Assuming that the number of accidents per day follows the Poisson distribution, find the probability that there will be three or more accidents in a day.
19. A sample of 400 items is found to have a mean of 67.47. Can it be reasonably regarded as sample from a large population with mean 67.39 and standard deviation 1.30.
20. Find the Z-transform of $\cos n\theta$.
21. Find the fixed point of the bilinear transformation $w = \frac{z-1}{z+1}$.
22. Expand $f(z) = e^z$ in a Taylor's series about $z = 0$.
23. The mean of a binomial distribution is 10 and standard deviation 4, calculate n, p, q .
24. If mean height and standard deviation of height of 200 students of a college are 176.65 and 3.28 respectively, what is the confidence interval of mean height?
25. If $F(z) = \frac{1}{1-z}$ then find $f(0)$.
26. Show that the function $u = 2xy + 3y$ is harmonic.
27. Prove that $\int_C \frac{dz}{z-a} = 2\pi i$, where C is the circle $|z-a| = r$.
28. Two lines of regression are $8x - 10y + 66 = 0$ and $40x - 18y - 214 = 0$. Find the correlation coefficient of x and y .

29. The means of 2 large samples 1000 and 2000 members are 67.5 inches and 68.0 inches respectively. Can the samples be regarded as drawn from the same population of S.D 2.5 inches?
- 30.State initial and final value theorems of Z –transform.
- 31.Show that the function $u(x,y) = 3x^2y + 2x^2 - y^3 - 2y^2$ is Harmonic.
- 32.Evaluate $\int_c \frac{z-2}{z^2-z} dz$ where c is the circle $x^2 + y^2 = 4$.
- 33.Write the properties of Normal curve.
- 34.Intelligence tests were given to 2 groups of boys and girls. Examine if the difference between mean score is significant.

	Mean	SD	Size
Girls	75	8	60
Boys	73	10	100

35.Show that $Z \left[\frac{1}{n+1} \right] = z \log \frac{z}{z-1}$.

PART-C

1. a.If $f(z)$ is an regular function of z , prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} \right) |f(z)|^2 = 4|f'(z)|^2$
- b.Find the image of the following region under the transformation $w = \frac{1}{z}$ in the half plane $x > c$ when $c > 0$.
2. a. Find the analytic function $f(z) = u + iv$, given that $u = \frac{\sin 2x}{\cosh 2y + \cos 2x}$.

- b. Find the bilinear transformation which maps the points $i, -1, 1$ of the z plane into the point $0, 1, \infty$ of the w plane respectively.
3. a. Find the Laurent's series expansion of the function $f(z) = \frac{7z-2}{(z+2)z(z-2)}$ in the region $1 < |z+1| < 3$.
- b. Evaluate $\int_0^{2\pi} \frac{d\theta}{a+b\cos\theta}$ where $a > b > 0$, using contour integration.
4. a. Using Cauchy's Integral formula, Evaluate $\int_c \frac{z+4}{z^2+2z+5} dz$ where c is the circle $|z+1+i|=2$.
- b. Evaluate $\int_{-\infty}^{\infty} \frac{x^2}{(x^2+a^2)(x^2+b^2)} dx$, $a > 0, b > 0$ by using contour integration.

5. Compute the coefficient of correlation between x and y from the following data:

x	:78	36	98	25	75	82	90	62	65	39
y	:84	51	91	60	68	62	86	58	53	47

6. Find the coefficient of correlation between x and y from the following data:

x	:3	6	5	4	6	7	5
y	:3	2	3	5	6	6	4

Also calculate the regression line of y on x and predict the value of y when $x = 9$

7. Two independent sample of sizes 7 and 9 have the following values:

Sample A :10 12 10 13 14 11 10

Sample B :10 13 15 12 10 14 11 12 11

Test whether the difference between the mean is significant.

8. In a locality of 100 persons the following observations are made reference to their educational achievements

	Middle School	High School	College
Male :	10	15	25
Female :	25	10	15

Can you say that education depends on sex?

9. a. Find the inverse Z-transform of $\frac{z^2 + z}{(z-1)(z^2 + 1)}$ by using partial fraction.
 b. Solve $y_{n+2} + 6y_{n+1} + 9y_n = 2^n$ given $y_0 = y_1 = 0$.
10. a. Find the inverse Z-transform of $\frac{z^2 - 3z}{(z+2)(z-5)}$ by using Residues.
 b. Solve $y_{n+2} - 4y_{n+1} + 4y_n = 0$ given $y_0 = 1$ and $y_1 = 0$.
11. a. If $f(z)$ is a regular function of $z = x + iy$, prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right) |f(z)|^2 = 4|f'(z)|^2$.
 b. Find the image of the strip $\frac{1}{4} \leq y \leq \frac{1}{2}$ under the transformation $w = \frac{1}{z}$. Also show the regions graphically.
12. a. Find the bilinear transformation which maps the points $z = 1, i, -1$ into points $w = i, 0, -i$.
 b. Show that $e^x (x \cos y - y \sin y)$ is a harmonic function. Find the analytic function $f(z)$ for which $e^x (x \cos y - y \sin y)$ is the imaginary part.
13. a. Using Cauchy's integral formula evaluate $\int_c \frac{z+4}{z^2 + 2z + 5} dz$, where c is the circle $|z + 1 + i| = 2$
 b. Using the method of contour integration, show that $\int_0^{2\pi} \frac{d\theta}{5 + 4\sin\theta} = \frac{2\pi}{3}$
14. a. Find the Laurent's series expansion of the function $f(z) = \frac{7z-2}{(z+1)(z)(z-2)}$ in the annular region $1 < |z+1| < 3$.
 b. Using contour integration evaluate $\int_{-\infty}^{\infty} \frac{x^2 dx}{(x^2 + a^2)(x^2 + b^2)}$, $a > 0, b > 0$.
15. a. Fit a poisson distribution to the following data and calculate the theoretical frequencies:

Deaths	0	1	2	3	4
--------	---	---	---	---	---

Frequency	122	60	15	2	1
-----------	-----	----	----	---	---

b. Calculate the first four moments about the mean from the following data.

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70
No. of Students	5	12	18	40	15	7	3

16. a. Calculate Spearman's coefficient of rank correlation for the following data:

X:	53	98	95	81	75	61	59	55
Y:	47	25	32	37	30	40	39	45

b. The weekly wages of 1000 workmen are normally distributed around a mean of Rs.70 with a S.D. of Rs.5. Estimate the number of workers whose weekly wages will be

(i) between Rs.69 and Rs.72 (ii) less than Rs.69 (iii) More than Rs.72.

17. a. In a big city 325 men out of 600 men were found to be smokers. Does this information support the conclusion that the majority of men in this city are smokers?

b. In a certain sample of 2000 families, 1400 families are consumers of tea. Out of 1800 Hindu families, 1236 families consume tea. Use χ^2 - test and state whether there is any significant difference between consumption of tea among Hindu and Non-Hindu families.

18. a. Random samples drawn from two countries gave the following data relating to the heights of adult males:

	Country A	Country B
Mean heights	67.42	67.25
Standard deviation	2.58	2.50
Number in samples	1000	1200

Is the difference between the means significant?

b. A sample of 26 bulbs gives a mean life of 990 hours with a Standard Deviation of 20 hours. The manufacturer claims that the mean life of bulbs is 1000 hours. Is the sample not upto the standard?

19. a. Using Convolution theorem evaluate $Z^{-1} \left[\frac{z^2}{(z-1)(z-3)} \right]$.



b. Using Z-transform solve difference equation $y(n + 2) - 4 y(n + 1) + 4 y(n) = 0$ given that $y(0) = 1$ and $y(1) = 0$.

20.a. Find the Z-transform of a^n and $a^n \cos n\theta$.

b. Find the inverse Z-transform of $\frac{z(z+1)}{(z-1)^3}$.

21. a. If $f(z) = u + iv$ is an analytic function of z in a domain D , then prove that

$$\left[\frac{\partial}{\partial x} |f(z)| \right]^2 + \left[\frac{\partial}{\partial y} |f(z)| \right]^2 = |f'(z)|^2$$

b. Find the image of the circle $|z-1|=1$ in the complex plane under the mapping

$$w = \frac{1}{z}$$

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

b. Find the bilinear transformation which maps the points $z = -2i, i, \infty$ on to the points $w = 0, -3, \frac{1}{3}$ respectively. Find the image of $|z| < 1$.

23.a. Expand $f(z) = \frac{z}{(z-1)(z-3)}$ as Laurent's series valid in the regions $1 < |z| < 3$ and $0 < |z-1| < 2$.

b. Evaluate $\int_C \frac{z-2}{z(z-1)} dz$ where C is the circle $|z| = 2$.

24. a. Using contour integration, prove that $\int_{-\infty}^{\infty} \frac{dx}{(x^2+1)^3} = \frac{3\pi}{8}$.

b. Obtain the Taylor's series expansion of the function $\frac{z-1}{z^2}$ in powers of $(z-1)$ and give the region of validity.

25. a. The first four moments of a distribution about the value 4 of the variable are -1.5, 17, -30 and 108. Find the moments about mean. Also calculate the mean and β_1 .

b. Calculate the rank correlation coefficient for the following data of marks of students in two subjects.

Mark in first subject	29	28	17	15	20	26	26	25	34	19
Mark in second subject	25	15	20	22	35	10	40	28	14	30

26. a. The regression equations of two series are $4y - 5x = 0$ and $5y - x - 63 = 0$. Calculate the mean values of x and y and the coefficient of correlation between x and y .
- b. Fit a Poisson distribution to the following data and calculate the theoretical frequencies.

x:	0	1	2	3	4
y:	123	59	14	3	1

27. a. A machinist is making engine parts with axle diameter of 0.700 inch. A random sample of 10 parts shows a mean diameter of 2.74 inch with a standard deviation of 0.4 inch. On the basis of this sample, would you say that the work is inferior?
- b. The theory predicts the proportion of beans in the four groups A, B, C and D should be 9:3:3:1. In an experiment among 1600 beans, the numbers in the four groups were 882, 313, 287 and 118. Does the experimental result support the theory?

28. a. In one sample of 8 observations the sum of the squares of deviations of the sample values from the sample mean was 84.4 and in the other sample of 10 observations it was 102.6. Test whether this difference is significant at 5 percent level.
- b. Random samples drawn from two countries gave the following data relating to the heights of adult males:

	Country A	Country B
Mean heights	67.42	67.25
Standard deviation	2.58	2.50
Number in samples	1000	1200

Is the difference between the means significant?

29. a. Find the z-transform of $\frac{1}{(n+1)(n+2)}$
- (7)
- b. Using residues, find the inverse z - transform of $\frac{z}{(z-1)(z^2+1)}$

30. Using z - transform, solve: $y_{n+2} + y_n = n \cdot 2^n$ given $y(0) = 0, y(1) = 1$.

31. a. Prove that if $u = x^2 - y^2$, $v = \frac{-y}{x^2 + y^2}$, both u and v satisfy Laplace's equation, but that $u + iv$ is not a regular function of z .
- b. Find the image of the rectangular region with vertices $(0, 0)$, $(1, 0)$, $(1, 2)$, $(0, 2)$ under the mapping $w = z + 2 + i$ and sketch it.

32. a. Find an analytic function whose real part is $e^x (x \cos y - y \sin y)$.
- b. Obtain the bilinear transformation which maps the points $z = 1, i, -1$ into the points $w = 0, 1, \infty$.

33. a. Obtain the Laurent's expansion of $f(z) = \frac{1}{z(z-1)}$ in the regions $0 < |z| < 1$ and $0 < |z-1| < 1$ (7)
- b. Evaluate $\int_c \frac{e^{z^2}}{\cos \pi z} dz$ where c is $|z| = 1$.

34. a. Using the method of contour integration, evaluate $\int_0^{2\pi} \frac{d\theta}{1 - 2a \cos \theta + a^2}$, $0 < a < 1$.
- b. Find the poles and residues of $\frac{z}{z^2 - 3z + 2}$.

35. a. The first four moments about 28.5 of a distribution are 0.294, 7.144, 42.409 and 454.98. Calculate the moments about the mean. Also evaluate β_1 and β_2 .
- b. From the following data calculate the coefficient of rank correlation between X and Y .

x:	36	56	20	65	42	33	44	50	15	60
y:	50	35	70	25	58	75	60	45	80	38

36. a. The two regression equations of the variables x and y are $x = 19.13 - 0.87y$ and $y = 11.64 - 0.50x$. Find \bar{x} and \bar{y} and the correlation coefficient between x and y .
- b. The screws produced by a certain machine were checked by examining samples of 12. The following table shows the distribution of 128 samples according to the number of defective items they contained.

Number of defectives:	0	1	2	3	4	5	6	7	Total
Number of samples:	7	6	19	35	30	23	7	1	128

Fit a binomial distribution and find the expected frequencies of the chance of screw being defective is $\frac{1}{2}$

37. a. In a survey of buying habits, 400 women shoppers are chosen at random in super market 'A' located in a certain section of the city. Their average weekly food expenditure is Rs.250 with a standard deviation of Rs. 40. For 400 women shoppers chosen at random in super market 'B' in another section of the city, the average weekly food expenditure is Rs. 220 with a standard deviation of Rs. 55. Test at 1% level of significance whether the average weekly food expenditures of the two populations of shoppers are equal.
- b. Two samples of sizes 9 and 8 give the sum of squares of deviations from their respective means equal to 160 inches square and 91 inches square respectively. Can they be regarded as drawn from the same normal population?
38. a. Samples of two types of electric light bulbs were tested for length of life and following data were obtained.

	Type I	Type II
Sample No.	$n_1 = 8$	$n_2 = 7$
Sample Means	$\bar{x}_1 = 1,234 \text{ hrs}$	$\bar{x}_2 = 1,036 \text{ hrs}$
Sample S.D.	$S_1 = 36 \text{ hrs}$	$S_2 = 40 \text{ hrs}$

Is the difference in the means sufficient to warrant that type I is superior to type II regarding length of life?

- b. The theory predicts the proportion of beans in the four groups A, B, C and D should be 9 : 3: 3: 1. In an experiment among 1600 beans, the numbers in the four group were 882, 313, 287 and 118. Does the experimental result support the theory?
39. a. Find $Z^{-1} \left[\frac{z(z^2 - z + 2)}{(z+1)(z-1)^2} \right]$ using partial fraction method.
- b. Find the Z -transform of $\frac{1}{n(n+1)}$ and $e^{3t} \sin 2t$.
40. a. Using z-transform solve: $y_{n+2} + 4y_{n+1} - 5y_n = 24n - 8$, given $y_0 = 3, y_1 = -5$.
41. a. Find the constants a, b, c if $f(z) = x + ay + i(bx + cy)$ is analytic.
- b. If $f(z) = u + iv$ is an analytic function and $u - v = e^x(\cos y - \sin y)$, find $f(z)$ in terms of z .
42. a. Plot the image under the mapping $w = z^2$ of the region bounded by $y = 1, x = 1$ and $x + y = 1$.

- b. Find the bilinear map which map the points $z = 1, i, -1$ onto the points $w = i, 0, -i$.
42. a. Evaluate, using Cauchy's integral formula, $\int_C \frac{1}{z - 1 - i} dz$, where C is the circle $|z - 1 - i| = 2$.
- b. If $0 < |z - 1| < 2$, then express $f(z) = \frac{1}{z - 1}$ in a series of positive and negative powers of $(z - 1)$.
43. Evaluate the integral $\int_{-\infty}^{\infty} \frac{e^{ax} - e^{bx}}{x} dx$, where $a > b > 0$.
44. a. A computer while calculating the correlation coefficient between two variables X and Y from 25 pairs of observations obtained the following results: $\sum X = 125$, $\sum Y = 100$, $\sum XY = 508$, $\sum X^2 = 650$, $\sum Y^2 = 460$. It was, however, discovered at the time of checking that he

had copied down two pairs as

X	Y
6	14
8	6

while the correct value was

X	Y
8	12
6	8

Obtain the correct value of the correlation coefficient.

- b. Ten competitors in a beauty contest are ranked by three judges in the following order:

1 st Judge:	1	6	5	10	3	2	4	9	7
2 nd Judge:	5	8	4	7	10	2	1	6	9
3 rd Judge:	6	4	9	8	1	2	3	10	5

Use the rank correlation coefficient to determine which pair of judges has the nearest approach to common tastes in beauty.

45. a. The following table shows the ages (X) and blood pressure (Y) of 8 persons.

X:	52	63	45	36	72	65	47	25
Y:	62	53	51	25	79	43	60	33

Obtain the regression equation of Y on X and find the expected blood pressure of a person who is 49 years old.

- b. The probability that an evening college student will graduate is 0.4. Determine the probability that out of 5 students (a) none (b) one, and (c) at least one will graduate.
 - c. Define Poisson distribution.
46. a. The mean weekly sales of soap bars in departmental stores were 146.3 bars per store. After an advertising campaign the mean weekly sales in 22 stores for a typical week increased to 153.7 and showed a standard deviation of 17.2. Was the advertising campaign successful?
- b. On the basis of information given below about the treatment of 200 patients suffering from a disease, state whether the new treatment is comparatively superior to the conventional treatment.

	Favorable	Not favorable	Total
New	60	30	90
Conventional	40	70	110

47. a. In a big city 325 men out of 600 men were found to be smokers. Does this information support the conclusion that the majority of men in this city are smokers?
- b. Pumpkins were grown under two experimental conditions. Two random samples of 11 and 9 pumpkins show the sample standard deviations of their weights as 0.8 and 0.5 respectively. Assuming that the weight distributions are normal, test the hypothesis that the true variances are equal.
48. a. Find the Z – Transform of (i) $\frac{1}{1-s}$, $s \geq 1$ ii s^2
- b. Define convolution of two sequences.
- c. Find the inverse Z – Transform of $\frac{1}{1-s^2}$
49. a. Find the inverse Z – transform of $\frac{1}{1-s^2}$, using convolution theorem.
- b. Solve $y_{n+2} + 6y_{n+1} + 9y_n = 2^n$ given $y(0) = y(1) = 0$.
50. a. Show that the function $u = \sin x \cosh y + 2 \cos x \sinh y + x^2 - y^2 + 4xy$ satisfies Laplace’s equation and find the corresponding analytic function $u + iv$.
- b. Find the image of the circle $|z| = 2$ by the transformation $w = z + 3 + 2i$.
51. a. If $f(z) = u + iv$ is analytic, prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right) \log |f'(z)| = 0$.



- b. Find the bilinear transformation which maps the points $z_1 = -1, z_2 = 0, z_3 = 1$ into the points $w_1 = 0, w_2 = i, w_3 = 3i$ respectively.
52. a. Using Cauchy's integral formula, evaluate $\int_C \frac{\cos \pi z^2}{(z-1)(z-2)} dz$, where C is the circle $|z| = 3$.
- b. Evaluate $\int_0^{2\pi} \frac{d\theta}{5-4\sin \theta}$.
53. a. Expand $\frac{1}{z^2 - 3z + 2}$ where $1 < |z| < 2$ by Laurent's series.
- b. Evaluate $\int_0^\infty \frac{dx}{(x^2 + 1)^3}$ using contour integration.
54. a. Given $\bar{x} = 970, \bar{y} = 18, \sigma_x = 38, \sigma_y = 2$. correlation co-efficient is $r = 0.6$. Find the line of regression line of x on y and obtain the value of x when $y = 20$.
- b. Find the correlation coefficient for the following heights (in inches) of fathers x and their sons y:

X	65	66	67	67	68	69	70	72
Y	67	68	65	68	72	72	69	71

55. In an examination, a student passes if he secures 30% or more marks. He is placed in the first, second or third division accordingly, as he secures 60% or more marks, between 45% and 60% marks and marks between 30% and 45% respectively. He gets a distinction in case he secures 80% or more marks. It is noticed from the results that 10% of the students failed in the exam, whereas 5% of them obtained distinction. Calculate the percentage of students placed in the second division. (Assume that marks are distributed normally.)
56. Two random samples gave the following results:

Sample	Size	Sample mean	Sum of squares of deviations from the mean
I	10	15	90
II	12	14	108

Test whether the samples come from the same normal population.

- 57.a. A die is thrown 264 times with the following results. Show that the die is biased.

No. appeared on the die.	1	2	3	4	5	6
--------------------------	---	---	---	---	---	---

Frequency	40	32	28	58	54	60
-----------	----	----	----	----	----	----

- b. In a sample of 400 parts manufactured by a factory, the number of defective parts was found to be 30. The company however claimed that only 5% of their product is defective. Is the claim tenable?
58. a. Find $Z^{-1} \left\{ \frac{4z^3}{(2z-1)^2(z-1)} \right\}$, by the method of partial fractions.
- b. Find $Z^{-1} \left\{ \frac{z}{z^2+2z+2} \right\}$, by the method of residues.
59. a. Solve the difference equation $y_{n+3} - 3y_{n+1} + 2y_n = 0$, given that $y(0) = 4$, $y(1) = 0$ and $y(2) = 8$.
- b. Find $Z[a^n \cos n\theta]$, $Z[a^n \sin n\theta]$.
60. a. Show that $u(x, y) = e^x (x \cos y - y \sin y)$ is harmonic. Hence find the corresponding analytic function $f(z)$.
- b. Show that the map $w = \frac{1}{z}$ maps the totality of circles and lines as circles and lines
61. a. Prove $u(x,y) = \log \sqrt{x^2 + y^2}$ is harmonic and hence find its harmonic conjugate and the corresponding analytic function $f(z)$.
- b. Find the bilinear map, which maps the points $z = 1, i, -1$ on to the points $w = i, 0, -i$.
62. a. Show that $\int_0^{2\pi} \frac{d\theta}{1-2a \cos \theta + a^2} = \frac{2\pi}{1-a^2}$ if $|a| < 1$.
- b. Expand $f(z) = \frac{z^2-1}{(z+2)(z+3)}$ in a Laurent Series if i) $|z| < 2$ ii) $2 < |z| < 3$.
63. a. Evaluate $\int_C \frac{(z-1)dz}{(z+1)^2(z-2)}$ where C is the circle $|z-i| = 2$.
- b. Show that $\int_{-\infty}^{\infty} \frac{(x^2-x+2)}{x^4+10x^2+9} dx = \frac{5\pi}{12}$.
64. a. The two lines of regressions are $40x-18y = 214$ and $8x-10y + 66 = 0$. Find the mean of x and y and also the correlation co-efficient between x and y.
- b. Calculate the correlation coefficient for the data height of father in X and their sons y.

X	65	66	67	67	68	69	70	72
y	67	68	65	68	72	72	69	71

65.a.Ten participants were ranked according to their performance in a musical test by 3 Judges.

Judges	x	1	6	5	10	3	2	4	9	7	8
	y	3	5	8	4	7	10	2	1	6	9
	z	6	4	9	8	1	2	3	10	5	7

Which pair of judge having common liking in music?

- b. The first four moments of a distribution about $x = 4$ are 1, 4, 10, 45 respectively. Find mean, variance, μ_3 and μ_4 .
66. Find the following table regarding the colour of eyes of father and son, test if the colour of son's eye is associated with that of the father.

		Eye colour of son	
		Light	Not light
Eye colour of Father	Light	471	51
	Not light	148	230

Given χ^2 at 5% for one degree of freedom is = 3.841

67. The nicotine contents in 2 random samples of tobacco are given below:-

Sample : 1	21	24	25	26	27	
Sample : 2	22	27	28	30	31	36

Can you say that the two samples came from the same normal population?

68. a. Find $z^{-1} \left[\frac{4z^3}{(2z-1)^2(z-1)} \right]$ using partial function method.

b. Find Z transform of $\frac{2n+3}{(n+1)(n+2)}$.

69. Solve using Z-transform $y_{n+2} - 7y_{n+1} + 12y_n = 2^n$ given. $y_0 = 0$ and $y_1 = 0$.



