**Reg. No. \_\_\_\_\_\_\_\_**

**Karunya University**

**(Karunya Institute of Technology and Sciences)**

(Declared as Deemed to be University under Sec.3 of the UGC Act, 1956)

**Supplementary Examination - June 2011**

**Subject Title: COMPLEX ANALYSIS, STATISTICS AND Z-TRANSFORMS**

**Time: 3 hours**

**Subject Code: MA246 Maximum Marks: 100**

#### **Answer ALL questions**

**PART – A (10 x 1 = 10 MARKS)**

1. Both the real and imaginary parts of an analytic function are \_\_\_\_\_\_\_\_\_\_.

2. \_\_\_\_\_\_\_\_\_\_ method is used in constructing analytic function.

3. The singularity z = a of f(z) such that is known as \_\_\_\_\_\_\_\_\_\_.

4. \_\_\_\_\_\_\_\_\_\_ contour is used to evaluate.

5. First central moment is always \_\_\_\_\_\_\_\_\_\_.

6. Kurtosis of normal distribution is \_\_\_\_\_\_\_\_\_\_.

7. The sample with size below 30 is known as \_\_\_\_\_\_\_\_\_\_.

8. Degrees of freedom for the Chi-square test of independence for a 3 x 4 contingency table is \_\_\_\_\_\_\_\_\_.

9. If Z(fn) = F(z), then Z (e-an fn) = \_\_\_\_\_\_\_\_\_\_.

10. Inverse Z –Transform of is \_\_\_\_\_\_\_\_\_\_.

**PART – B (5 x 3 = 15 MARKS)**

11. Determine the critical point of ω2 = (z - α) (z-β).

12. Find the Taylor series expansion of at z = 2.

13. Obtain the Poisson distribution that has a double mode at x =1 and x = 2.

14. Define: a) Null Hypothesis b) Type – I error c) Critical region.

15. Find the Z-transform of.

**PART – C (5 x 15 = 75 MARKS)**

16. a. Prove that the analytic function with constant modulus is a constant. (8)

b. Find the Bilinear transformation that transforms the points Z = -1, i, 1 onto ω =1, i, -1.

(7)

(OR)

17. a. Find the analytic function f(z) = u + iv, if u = ex (x cosy – y siny). (8)

b. Obtain the images of the straight lines parallel to the co-ordinate axes of the Z-plane under the transformation ω = z2. (7)

18. a. Evaluate by Cauchy’s integral formula. (8)

b. Using Residue theorem, evaluate  (7)

[P.T.O]

(OR)

19. a. Find the Laurent’s series of f(z) = in 1< | 2+1| < 3. (8)

b. Evaluate, by contour integration. (7)

20. a. Find the coefficient of Skewness and Kurtosis of a distribution whose first four raw moments are 1, 3, 6 and 10. (8)

b. A machine manufacturing screws is known to produce 5% defectives. A sample of 15 screws is taken for inspection. Find the probability that i) all are good (ii) exactly two defectives (iii) atleast one defective and (iv) atmost 2 defectives. (7)

(OR)

21. a. Find the regression equations to the following data: (8)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| X: | 65 | 66 | 67 | 67 | 68 | 69 | 70 | 72 |
| Y: | 67 | 68 | 65 | 68 | 72 | 72 | 69 | 71 |

b. Find the mean and SD of the Normal distribution in which 7% of the items are below 35 and 11% are above 63. (7)

22. a. A mathematics test was given to 50 girls and 75 boys. The girls made an average grade of 76 with a SD of 6, while boys made an average grade of 82 with a SD of 2. Test whether there is any significant difference between the performance of girls and boys at 5% level.

(8)

b. Mendal’s theory predicts the proportion of beans in four groups A, B, C, D should be in the ratio 9:3:3:1. In an experiment among 1600 beans, the numbers in the four groups are found to be 882, 313, 287 and 118. Does the experimental result support the theory at 5% level? (7)

(OR)

23. a. The time taken by workers in performing a job by 2 methods are given below

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Method-I: | 20 | 16 | 26 | 27 | 23 | 22 |
| Method – II: | 27 | 33 | 42 | 35 | 32 | 34 | 38 |

Test whether there is any significant difference between the variances of the population at 5% level. (8)

b. A machine puts out 16 imperfect articles in a batch of 500. After it was overhauled, it puts out 3 imperfect articles in a sample of 100. Has the machine improved in its performance? (7)

24. a. Find Z (Cos nθ) and hence deduce Z (an. cos nθ). (8)

b. Find Z-1 using partial fraction technique. (7)

(OR)

25. a. Using Z-transform, solve: yn+2 + 4yn+1 + 3yn = 3n; y0 = 0, y1 =1. (8)

b. State and prove the second shifting property of Z –transform. (7)