

[05 - 2204]

II/IV B.E. DEGREE EXAMINATION.

Second Semester

Electronics and Communication Engineering

MATHEMATICS - IV

(Common for all branches)

(Effective from the admitted batch of 2004-2005  
and after batches)

Time : Three hours

Maximum : 70 marks

Answer ALL questions in Part A and FOUR from  
Part B out of seven questions.

All questions carry equal marks.

Question of Part A must be answered at one place.

PART A

1. (a) Is the function  $|z|$  analytic? Justify your  
answer.

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

$$|z| = 1.$$

- 4  
ECLB
7. (a) Solve the difference equation

$$y_{n+2} - 6y_{n+1} + 8y_n = 2^n + 6n.$$

- (b) Find the response of the system

$$y_{n+2} - 5y_{n+1} + 6y_n = 1 \text{ with } y_0 = 0, y_1 = 1 \text{ by } z\text{-transform method.}$$

8. (a) Using the inversion integral method, find the inverse  $z$ -transform of  $\frac{10z}{(z-1)(z-2)}$ .

- (b) Given the  $Z(u_n) = \frac{2z^2 + 3z + 4}{(z-3)^3}$ ;  $|z| > 3$  find the values of  $u_1, u_2$  and  $u_3$ .

- (c) Find the residue of  $\frac{ze^z}{(z-1)^3}$  at its pole.
- (d) What do you mean by test of significance?
- (e) What is Null Hypothesis?
- (f) Find the  $z$ -transform of  $n^2$ .
- (g) Solve the difference equation  $u_{n+1} - 2u_n + 2iu_{n-1} = 0$ .

PART B

2. (a) Consider the function

$$f(z) = \begin{cases} xy^2(x+iy) + (x^2 + y^4), & z \neq 0 \\ 0 & z = 0 \end{cases}$$

Are the Cauchy-Reimann equations satisfied by  $f$  at the origin? Is  $f$  analytic at  $z = 0$ ? Justify your claim.

- (b) Find analytic function  $f(z) = u(r, \theta) + iv(r, \theta)$  such that  $u(r, \theta) = r^2 \cos 2\theta - r \cos \theta + 2$ .
3. (a) State and prove Cauchy's integral formula.
- (b) Show that under the transformation  $w = \frac{1}{z}$  maps a circle into a circle.

4. (a) Find the nature and location of the singularities of  $f(z) = \frac{1}{z(z-2)(z-3)^3(z+5)^2}$ .

(b) Using the calculus of residues, show that

$$\int_0^{2\pi} \frac{d\theta}{(5-3\cos\theta)^2} = \frac{5\pi}{32}$$

5. (a) A die was thrown 9000 times and a throw of 5 or 6 was obtained 3240 times. On the assumption of random throwing, do the data indicate an unbiased die?

(b) 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 mean by more than 25% of S.D. How large a sample should be taken?

6. (a) Write and discuss the properties of  $t$ -distribution.

(b) Fit a Poisson distribution to the following data and test for its goodness of fit at level of significance 0.05.

$x$	0	1	2	3	4
$y$	419	352	154	56	19