

[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

$$|z| = 1.$$

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 $u_{n+1} - 2u_n + 2u_{n-1} = 0$.

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