



Semester End Examination - January 2022
Course Code : MAT 201 Course Name : Mathematics - III
School of Engineering & Information Technology

Programme: B. Tech (All Branch) (Regular & Lateral)
Time: 3 hrs

Semester: III
Max. Marks:100

PART - A (10 questions X 2 marks = 20 Marks)
Answer ALL the Questions

1. Attempts all parts. All parts carry equal marks. Write answer of each part in short.
 - a. Write Fourier complex Integral theorem. [2]
 - b. Find the Z-transform of $\frac{\{a^{k+2}\}}{k!}$. [2]
 - c. A bag contains 5 white and 10 black balls. Two balls are drawn in succession. What is the probability that first is white and second is black? [2]
 - d. Find the Z-transform of 2^k . [2]
 - e. Write the Poisson distribution. [2]
 - f. What is the formula of Inverse Fourier cosine transformation. [2]
 - g. Show that the function $u = e^x \sin y$ is harmonic. [2]
 - h. Write the statement of Cauchy Integral Theorem. [2]
 - i. Define the single valued and multivalued function [2]
 - j. Expand $f(z) = \frac{1}{(z+1)(z+3)}$ in Laurent series valid for $1 < |z| < 3$ [2]

PART - B (4 questions X 5 marks = 20 Marks)
(Answer all questions)

2. Evaluate the Z-Transform of $\sin \alpha k, k \geq 0$. [5]
3. Find the probability of getting 4 heads in 8 tosses of a fair coin. [5]
4. Find the harmonic conjugate function of $u = 2x(1 - y)$. [5]
5. Determine the residue at simple pole $z=1$ of the function $f(z) = \frac{2z^2}{(z-1)(z+2)}$ [5]

PART - C (3 questions X 10 marks = 30 Marks)
Answer Three out of Four Questions

6. Evaluate the following complex integration using Cauchy's integral formula [10]
$$\int_c \frac{3z^2+z+1}{(z+3)(z^2-1)} dz$$
 where c is the circle $|z| = 2$.
7. Find the inverse Z-transform of $f(z) = \frac{2z+1}{z^2+5z+6}$ [10]
- 8.(a) If $f(z) = u + iv$, is any analytic function of the complex variable z and $u - v = e^x(\cos y - \sin y)$, find $f(z)$ in terms of z [10]
(b) Suppose that a book of 600 pages contains 40 printing mistakes. Assume that these errors are randomly distribution throughout the book and x the number of error per

page has Poisson distribution what is the probability that 10 pages selected at random will be free of error.

- 9.(a) Find Fourier sine integral for $f(x) = e^{-|x|}$ hence evaluate $\int_0^{\infty} \frac{x \sin mx}{1+x^2} dx$ [10]
- (b) Determine the residue at simple pole of the function $f(z) = \frac{z^2}{(z-a)^2(z+b)}$

PART - D (2 questions X 15 marks = 30 Marks)

Answer Two out of Three Questions

10. Find Fourier cosine transform of $\frac{e^{-ax}}{x}$, $a > 0$. Hence find Fourier sine transform of $\frac{1}{x}$. [15]
11. Evaluate the integral $\int_0^{2\pi} \frac{d\theta}{5-3\cos\theta}$. [15]
- 12.(a) Find the imaginary part of analytic function whose real part is $x^3 - 3xy + 3x^2 - 3y^2$. [15]
- (b) A die thrown 8 times and it is required to find the probability that 3 will show (i) Exactly 2 times (ii) at least seven times (iii) at least once.