

American International University-Bangladesh

Faculty of Science & Technology

Department of Mathematics

MAT2101: Complex Variables, Laplace and Z-transformations

Final Examination Spring: 2021-2022

Total Marks: 40 Time: 1.5 hour

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**Instruction: Answer all the questions with the given conditions.**

1. Answer the following questions:
2. Sketch the path and its orientation given by .
3. Sketch and represent  parametrically, counter clockwise.
4. Test whether the point is interior, exterior or boundary of .
5. Find the equation of the path *C,* whichis the line segment from  to .
6. Find the singular points (poles) and corresponding order of .
7. Find the residue at the singular point of  for .
8. Evaluate is the discrete time unit step function.
9. Evaluate is the Kronecker delta function.
10. Evaluate Also find ROC (Region of Convergence).
11. Evaluate 
12. Evaluate 
13. Evaluate 
14. Evaluate 
15. Answer the following questions:
16. Sketch the path , where consists of line segment from  to  and hence evaluate .
17. Sketch the path , where is the circle , (counter clockwise) and hence evaluate .
18. Evaluate  using the **Cauchy residue theorem**.
19. Expand in a Laurent series valid for .

1. Answer the following questions:
2. Determine the sequence by using inverse Z-transform of

Also sketch the sequence .

1. Determine inverse Z-transform of 
2. Use the Z-transform to determine for

.

1. Consider an LTI system with input and output that satisfies the difference equation with zero initial conditions

Compute

1. The transfer function .
2. The discrete-time impulse response .
3. The response when the input is the discrete unit step function

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| Important Formulae:   1. . 2. . 3. . 4. . 5. . |