**Module 4: Complex Variables II**

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| **Q.No** | **Question** |
| 1. | 1. Evaluate, where C is square with the following vertices (0, 0), (1, 0), (1, 1) and (0, 1). 2. Evaluate , along (i) the straight line , (ii) the real axis from 0 to 2 and then vertically to |
| 2. | 1. Evaluate along the curve made up of two line segment, one from z = 0 to z = 3 and another from . 2. Evaluate along (i) the straight line and (ii) the parabola. |
| 3. | 1. Evaluate , where (i) C is the straight line from the point to the point (ii) C is the left half of the circle from to . 2. Evaluate along the straight line joining the points |
| 4. | 1. Evaluate along the straight from (0, 3) to (2, 4) 2. State and prove Cauchy’s theorem. |
| 5. | 1. Verify Cauchy’s theorem for the analytic function where C is the square having vertices (0, 0), (1, 0), (1, 1) and (0, 1) 2. Verify Cauchy’s theorem for the analytic function where C is the square having vertices |
| 6. | 1. Verify Cauchy’s theorem for the analytic function over the unit circle with origin as the Centre. 2. Verify Cauchy’s theorem for the analytic function taken over the triangle formed by the points (1, 2), (3, 2) and (1, 4). |
| 7. | Verify Cauchy’s theorem for the analytic function taken over the boundary of the (i) rectangle with vertices , (ii) triangle with (1, 2) , (1, 4), (3, 2) . |
| 8. | 1. Verify Cauchy’s theorem for the analytic function of along the boundary of the triangle with the vertices 2. Expand in Taylor’s Series about the point . |
| 9. | 1. Expand in Taylor’s Series about the point . 2. Find the Taylor’s Series expansion of about the point |
| 10. | Find the Taylor’s Series expansion of about the points (i) (ii) . |
| 11. | 1. Find the Taylor’s Series expansion of about the point up to second order. 2. Find the Taylor’s Series expansion of about the point z=2 upto to first four terms. |
| 12. | Expand in Laurent’s series that is valid for (i) (ii) 0 < . |
| 13. | Expand as Laurent’s series in the region (i) , (ii) . |
| 14. | Expand as Laurent’s series in the region (i) , (ii) . |
| 15. | Expand as Laurent’s series in the region (i) , (ii) . |
| 16. | 1. Define the following for an analytic function f(z) (i) Singularity, (ii) Isolated singularity, (iii) Removable singularity, (iv) Essential singularity 2. Determine the residue of at its simple poles. |
| 17. | 1. Find the residue at z = 0 of . 2. State Cauchy’s Residue Theorem and hence evaluate where C is |
| 18. | 1. Evaluate where C is using Cauchy’s Residue Theorem. 2. Evaluate , where C is by using Cauchy’s Residue Theorem. |
| 19. | 1. Evaluate where C is by using Cauchy’s Residue Theorem. 2. Using Cauchy’s Residue Theorem ,evaluate where C is |
| 20. | 1. Evaluate where C is the circle by using Cauchy’s Residue Theorem. 2. Evaluate where C is the circle by using Cauchy’s Residue Theorem. |