Reg. No. \_\_\_\_\_\_\_\_\_\_\_\_



**End Semester Examination – Nov / Dec – 2019**

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| **Code :** | **17MA2001** | **Duration :** | **3hrs** |
| **Sub. Name :** | **VECTOR CALCULUS AND COMPLEX ANALYSIS** | **Max. Marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | A particle moves along the curves x=2t2, y = t2 – 4t, z = 3t -5, where ‘t’ denotes time. Find the component of its velocity, speed and acceleration at t=1 in the direction of | CO5 | 10 |
| b. | If find div and curl at (1, 2, 0). | CO5 | 5 |
| c. | If find | CO5 | 5 |
| **(OR)** | | | | |
| 2. | a. | Prove that and hence show that if is solenoidal. | CO5 | 10 |
| b. | Show that is a conservative force and hence find its scaler potential ϕ. | CO5 | 10 |
|  |  |  |  |  |
| 3. |  | Verify Gauss divergence theorem for over the cube bounded by x = 0, x = 1, y = 0, y = 1, z= 0 and z = 1. | CO1 | 20 |
| **(OR)** | | | | |
| 4. | a. | If evaluate where C is the curve y = x3 in the xy plane from the point (1, 1) to (2, 8). | CO1 | 5 |
| b. | Verify Stoke’s theorem for where S is the upper half surface of the sphere x2 + y2 + z2 = 1 and C is the circular boundary on Z = 0 plane. | CO1 | 15 |
|  |  |  |  |  |
| 5. | a. | Prove that v(x,y) = x3 – 3xy2 + 2x + 1 is harmonic. Find the corresponding analytic function f(z) and hence find its conjugate harmonic ‘u’. | CO4 | 15 |
| b. | Find the constants a, b and c if f(z) = (y2 + xy – x2) + i (ax2 + bxy + cy2) is analytic. | CO4 | 5 |
| **(OR)** | | | | |
| 6. | a. | Find the orthogonal trajectories of u(x, y) = x4- 6 x2y2 + y4. | CO2 | 10 |
| b. | Show that f(z) = cos z is analytic and hence find its derivative. | CO2 | 10 |
|  |  |  |  |  |
| 7. | a. | Find the image of the region bounded by the lines x = 0, y = 0 and  x+y = 1 in the Z-plane under the mapping (i) w = z+3+2i (ii) w = 2z | CO3 | 10 |
| b. | Find the image of an infinite strip under the mapping  . | CO3 | 10 |
| **(OR)** | | | | |
| 8. | a. | Find the bilinear transformation that maps 1, i, -1 of the Z-plane onto 0, 1, ∞ of the W-plane. | CO3 | 10 |
| b. | Discuss the transformation w = sinz. | CO3 | 10 |
|  | | **Compulsory:** |  |  |
| 9 | a. | Find the Laurentz series of in the region (i) |Z| < 1  (ii) |Z| >3 (iii) 1 < |Z| < 3. | CO4 | 10 |
| b. | Evaluate using contour integration. | CO6 | 10 |