**20MA201**

**Hall Ticket Number:**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **I/IV B.Tech (Regular) DEGREE EXAMINATION** | | | |
| **August, 2022** | **Common to All Branches** | | |
| **Second Semester** | **Numerical Methods and Advanced calculus** | | |
| **Time:** Three Hours | | **Maximum:** 70 Marks | |
| ***Answer question 1 compulsory.*** | | | **(14X1 = 14Marks)** |
| ***Answer one question from each unit.*** | | | **(4X14=56 Marks)** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  | CO | BL | M |
| 1 | a) | Find an interval which contains a real root of the equation +2x – 5 = 0. | CO1 | L1 | 1M |
|  | b) | When do you say that Gauss-Seidel method converges? | CO1 | L1 | 1M |
|  | c) | Differentiate between Gauss elimination method and Gauss Jordan method. | CO1 | L1 | 1M |
|  | d) | Among the bisection method and Newton-Raphson method, which method converges rapidly? | CO1 | L1 | 1M |
|  | e) | State Newton’s forward interpolation formula. | CO2 | L1 | 1M |
|  | f) | Write the Simpson’s one-third rule to evaluate the integral by dividing the interval in to 10 sub intervals. | CO2 | L1 | 1M |
|  | g) | Write the successive approximation formula of Picard’s method. | CO2 | L1 | 1M |
|  | h) | Evaluate . | CO3 | L2 | 1M |
|  | i) | Write the formula to find area enclosed by the plane curves in Cartesian coordinates. | CO3 | L1 | 1M |
|  | j) | Change in to polar coordinates. | CO3 | L1 | 1M |
|  | k) | Find divergence of a vector point function f(x,y,z)=xyz. | CO4 | L1 | 1M |
|  | l) | In which direction the directional derivative of a scalar function is maximum? | CO4 | L1 | 1M |
|  | m) | Find a unit vector normal to the surface x+y+2z=4 at the point (1,1,1). | CO4 | L2 | 1M |
|  | n) | State Gauss Divergence theorem. | CO4 | L1 | 1M |
| **Unit-I** | | | | | |
| 2 | a) | Find by Newton-Raphson method a real root of the equation x sinx + cosx = 0 which is near x = π, correct to four decimal places. | CO1 | L2 | 7M |
|  | b) | Solve the system of equations x + y + 54z = 110; 27x + 6y – z = 85; 6x + 15y + 2z = 72 by Gauss-Seidel method. Perform four iterations. | CO1 | L2 | 7M |
|  |  | **(OR)** |  |  |  |
| 3 | a) | Use method of False position to find a positive real root of the equation x3 -2x-5=0 correct to three decimal places. | CO1 | L2 | 7M |
|  | b) | Apply factorization method to solve the equations 3x + 2y + 7z = 4; 2x + 3y + z = 5; 3x + 4y + z = 7. | CO1 | L3 | 7M |
| **Unit-II** | | | | | |
| 4 | a) | Find f(41) from the following table using Newton’s backward formula.   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | x | 20 | 25 | 30 | 35 | 40 | 45 | | f(x) | 354 | 332 | 291 | 260 | 231 | 204 | | CO2 | L2 | 7M |
|  | b) | The velocity of a certain kind of oil is experimentally measured at different temperatures as shown in the following table.   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Temperature in oC | 110 | 130 | 160 | 190 | | Viscosity of the oil | 10.8 | 8.1 | 5.5 | 4.8 |   Using this table, find the viscosity of this oil at 140oC by using Lagrange’s interpolation formula. | CO2 | L2 | 7M |
| **(OR)** | | | | | |
| 5 | a) | Consider the function f(x) = 2 – x. calculate the integral of f(x) from x = 1 to x = 2 with step size of using Trapezoidal rule. | CO2 | L2 | 7M |
|  | b) | Using Runge-Kutta method of order 4, find y(0.2), given that = 3x + , y(0) = 1, taking h = 0.2. | CO2 | L3 | 7M |
| **Unit-III** | | | | | |
| 6 | a) | Changing the order of integration in by and hence evaluate the same. | CO3 | L3 | 7M |
|  | b) | Find the area included between the circles r = 2 sinθ and r = 4 sinθ. | CO3 | L2 | 7M |
| **(OR)** | | | | | |
| 7 | a) | Evaluate . | CO3 | L2 | 7M |
|  | b) | Find the volume bounded by the cylinder + = 4 and the planes y + z = 4 and z = 0. | CO3 | L3 | 7M |
| **Unit-IV** | | | | | |
| 8 | a) | Find the values of a and b so that the surfaces a – byz = (a + 2)x and 4y + = 4 intersect orthogonally at the point (1, -1, 2). | CO4 | L2 | 7M |
|  | b) | Find the value of n for which the vector is solenoidal vector, where = x + y + z and r = . | CO4 | L2 | 7M |
| **(OR)** | | | | | |
| 9 | a) | Find the work done when a force = ( – + x) - (2xy + y) moves a particle from origin to the point (1, 1) along the parabola = x. | CO4 | L2 | 7M |
|  | b) | Apply Green’s theorem to evaluate , where C is the boundary of the area enclosed by the x-axis and the upper half of the circle = 4. | CO4 | L3 | 7M |

