**20MA201**

**Hall Ticket Number:**

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| **I/IV B.Tech (Regular / Supplementary) DEGREE EXAMINATION** | | | | | | | | | | |
| **August,2022** | | | | | **Common to all branches** | | | | | |
| **Second Semester** | | | | | **Numerical Methods & Advanced Calculus** | | | | | |
| **Time:** Three Hours | | | | | | **Maximum: 7**0 Marks | | | | |
| ***Answer question 1 compulsory.*** | | | | | | | **(14X1 = 14 Marks)** | | | |
| ***Answer one question from each unit.*** | | | | | | | **(4X14=56 Marks)** | | | |
| 1. | a) | | Find an interval which contains a real root of the equation +2x – 5 = 0. | | | | CO1 |  |
|  | b) | | When do you say that Gauss-Seidel method converges? | | | | CO1 |  |
|  | c) | | Differentiate between Gauss elimination method and Gauss Jordan method. | | | | CO1 |  |
|  | d) | | Among the bisection method and Newton-Raphson method, which method converges rapidly? | | | | CO1 |  |
|  | e) | | State Newton’s forward interpolation formula. | | | | CO2 |  |
|  | f) | | Write the Simpson’s one-third rule to evaluate the integral by dividing the interval in to 10 sub intervals. | | | | CO2 |  |
|  | g) | | Write the successive approximation formula of Picard’s method. | | | | CO2 |  |
|  | h) | | Evaluate . | | | | CO3 |  |
|  | i) | | Write the formula to find area enclosed by the plane curves in Cartesian coordinates. | | | | CO3 |  |
|  | j) | | Change in to polar coordinates. | | | | CO3 |  |
|  | k) | | Find divergence of a vector point function f(x,y,z)=xyz. | | | | CO4 |  |
|  | l) | | In which direction the directional derivative of a scalar function is maximum? | | | | CO4 |  |
|  | m) | | Find a unit vector normal to the surface x+y+2z=4 at the point (1,1,1). | | | | CO4 |  |
|  | n) | | State Gauss Divergence theorem. | | | | CO4 |  |
| **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 | 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 | 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 | 7M |
|  | | b) | Apply factorization method to solve the equations 3x + 2y + 7z = 4; 2x + 3y + z = 5; 3x + 4y + z = 7. | | | | CO1 | 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 | 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 | 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 | 7M |
|  | | b) | Using Runge-Kutta method of order 4, find y(0.2), given that = 3x + , y(0) = 1, taking h = 0.2. | | | | CO2 | 7M |
|  | |  | **UNIT-III** | | | |  |  |
| 6. | | a) | Changing the order of integration in by and hence evaluate the same. | | | | CO3 | 7M |
|  | | b) | Find the area included between the circles r = 2 sinθ and r = 4 sinθ. | | | | CO3 | 7M |
|  | |  | **(OR)** | | | |  |  |
| 7. | | a) | Evaluate . | | | | CO3 | 7M |
|  | | b) | Find the volume bounded by the cylinder + = 4 and the planes y + z = 4 and z = 0. | | | | CO3 | 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 | 7M |
|  | | b) | Find the value of n for which the vector is solenoidal vector, where = x + y + z and r = . | | | | CO4 | 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 | 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 | 7M |

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