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**UNIVERSITY**

(Karunya Institute of Technology & Sciences)

(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

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

**End Semester Examination – Nov/Dec - 2016**

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|  |  | **Semester :** | **2016-17 ODD** |
| **Code :** | **12MA211/11MA205** | **Duration :** | **3 hrs** |
| **Sub. Name :** | **Numerical Methods for**  **Biotechnologists** | **Max. marks :** | **100** |

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| **Q. No.** | **Questions** | **Marks** |
| **PART-A(10X1=10 MARKS)** | | |
| 1. | Write the normal equation to fit a parabola using the method of least squares? | (1) |
| 2. | What is the principle of method of group averages? | (1) |
| 3. | Give an example of direct method to solve the system of linear equations. | (1) |
| 4. | What is the order of convergence of Newton Raphson method. | (1) |
| 5. | State Gauss’s backward Interpolation formula. | (1) |
| 6. | To fit a polynomial , where the values of independent variable are not equally spaced we use -------- formula. | (1) |
| 7. | Simpson’s 3/8 th rule is applicable when n is a multiple of ------. | (1) |
| 8. | write the Newton’s forward difference formula to find the second derivative of y=f(x). | (1) |
| 9. | State Improved Euler’s formula to solve the first order differential equations with the given initial conditions. | (1) |
| 10. | In solving , write down the formula used in Modified Euler’s method. | (1) |

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| **PART B(5 X 3= 15 MARKS)** | | |
| 11 | What is the linear form of the curve ? | (3) |
| 12 | Calculate the general formula to find using Newton Raphson method | (3) |
| 13 | What is lagrange’s interpolation formula and Inverse lagrange’s interpolation formula. | (3) |
| 14 | Find the first derivative of y=x1/3 at x=56 from the given data.   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | x | 50 | 51 | 52 | 53 | 54 | 55 | 56 | | y | 3.6840 | 3.7084 | 3.7325 | 3.7563 | 3.7798 | 3.8030 | 3.8259 | | (3) |
| 15 | Given  find y(0.01) using Euler’s method. | (3) |

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| **PART C(5 X 15= 75 MARKS)** | | | | |
| 16. | a. | Fit a straight line of the form y=a+bx, by the method of group averages for the following data.   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | x | 0 | 5 | 10 | 15 | 20 | 25 | | y | 12 | 15 | 17 | 22 | 24 | 30 | | 7 | |
| b. | It is known that the curve fits in the data given below. Find the best values of a and b using the method of least squares.   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | x | 1 | 2 | 3 | 4 | 5 | 6 | | y | 1200 | 900 | 600 | 200 | 110 | 50 | | 8 | |
| (OR) | | | | |
| 17. | a. | Fit a straight line to the following data using method of least squares. Also estimate the value of y at x=2.5.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | x | 0 | 1 | 2 | 3 | 4 | | y | 1 | 1.8 | 3.3 | 4.5 | 6.3 | | 7 | |
| b. | From the table given below, find the best values of a and b in the law  by the method of least squares.     |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | x | 0 | 5 | 8 | 12 | 20 | | y | 3 | 1.5 | 1 | 0.55 | 0.18 | | 8 | |
| 18. | a. | Solve the system by Gauss Jordan method. | 8 | |
| b. | Solve the system by Gauss Elimination method. | 7 | |
| (OR) | | | | |
| 19. | a. | Solve the following system by Gauss Seidel method correct to three decimal places. | 15 | |
| 20. | a. | Using the following table, apply Gauss’s forward Interpolation formula to get f(3.75).   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | x | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 | 5.0 | | y | 24.145 | 22.043 | 20.225 | 18.644 | 17.262 | 10.047 | | 15 | |
| (OR) | | | | |
| 21. | a. | Using Newton’s Interpolation formula, find the values of y at x=21 and x=28 from the following data.   |  |  |  |  |  | | --- | --- | --- | --- | --- | | x | 20 | 23 | 26 | 29 | | y | 0.3420 | 0.3907 | 0.4384 | 0.4848 | | 15 | |
| 22. | a. | By dividing the range into ten equal parts, evaluate  by Trapezoidal rule and Simpson’s rule. Verify your answer with direct Integration. | 15 | |
| (OR) | | | | |
| 23. | a. | The table given below reveals the velocity v of a moving particle at time ‘t’ seconds. Find the distance covered by the particle in 12 seconds and also the acceleration at t=2 seconds.   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | t | 0 | 2 | 4 | 6 | 8 | 10 | 12 | | v | 4 | 6 | 16 | 34 | 60 | 94 | 136 | | | 15 |
| 24. | a. | Using Runge Kutta method of fourth order, solve  at  x = 0.2, 0.4. | | 15 |
| (OR) | | | | |
| 25. | a. | Using Taylor series method, find y(1.1), y(1.2) given dy/dx = (x+y), y(1)=0. | | 15 |

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