K-451

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MT-608

NUMERICAL ANALYSIS-II

MA/MSC Mathematics (MAMT/MSCMT)

4th Semester Examination, 2023 (Dec.)

Time : 2 Hours] **[Max. Marks : 35**

Note : This paper is of Thirty Five (35) marks divided into two (02) Sections A and B. Attempt the questions contained in these sections according to the detailed instructions given therein. Candidates should limit their answers to the questions on the given answer sheet. No additional (B) answer sheet will be issued.

SECTION–A

(Long Answer Type Questions)

Note : Section 'A' contains Five (05) long answer type questions of Nine and Half (9½) marks each. Learners are required to answer any Two (02) questions only. (2×9½=19)

1. From the taylor series for $y(x)$, find $y(0.1)$ correct to four decimal places if $y(x)$ satisfies $y = x - y^2$ and $y(0) = 1$.

2. Find the solution of $\frac{dy}{dx} = 1 + xy$ which passes through (0, 1) in the interval (0, 0.5) such that the value of y is correct to three decimal places. Take $h = 0.1$.

3. Use the runge-kutta method to solve the equation $\frac{dy}{dx} = 1 + y^2$ for $x = 0.2$ to $x = 0.6$ with $h = 0.2$. Given the initially at $x = 0$, $y = 0$.

4. Given the boundary value problem $x^2y'' + xy' - y = 0$, $y(1) = 1$, $y(2) = 0.5$ apply the cubic spline method to determine the value of $y(1.5)$.

5. Compute $y(1)$ by Adams-Moulton method, given that $dy/dt = y - t^2$, $y(0) = 1$ $y(0.2) = 1.2859$, $y(0.4) = 1.46813$, $y(0.6) = 1.73779$.

SECTION–B

(Short Answer Type Questions)

Note : Section 'B' contains Eight (08) short answer type questions of Four (04) marks each. Learners are required to answer any Four (04) questions only. (4×4=16)

1. Using the method of least squares, find contants a and b such that the function $y = ae^{bx}$ fits the following data:

(1.0, 2.473), (3.0, 6.722), (5.0, 18.274), (7.0, 49.673), (9.0, 135.026).

2. Find the best lower degree approximation polynomial to $2x^3 + 3x^2$.

3. Certain experimental values of x and y are given below:

(0, –1), (2, 5), (5, 12), (7, 20). If the straight line Y= $a_0 + a_1 x$ is fitted to the above data, find the approximate values of a_0 and a_1.

4. Given that differential equation $\frac{dy}{dx} = \frac{x^2}{y^2+1}$ with the initial condition $y = 0$ when $x = 0$, use Picard's method to obtain y for $x = 0.25$, 0.5 and 1.0 correct to three decimal places.

5. For the differential equation $\frac{dy}{dx} - xy^2$ find by runge-kutta method of fourth order $y(0.6)$, given that $y = 1.7231$ at $x = 0.4$. Take $h = 0.2$.

6. Obtain Taylor series expansion of the function $f(x) = e^x$, about $x = 0$. Find the number of terms of the exponential series such that their sum gives the value of e^x correct to six decimal places at $x = 1$.

7. Given the differential equation $\frac{dy}{dx} = x^2 + y$ with $y(0)=1$, compute $y(0.02)$ using Euler's modified method.

8. The difference equation $y' - x^2 + y - 2$ satisfies the following data:

X	Y
–0.1	1.0900
0	1.0000
0.1	0.8900
0.2	0.7605

Use Milne's method to obtain the value of $y(0.3)$.