2021

MATHEMATICS — HONOURS — PRACTICAL

Eighth Paper

(Module - 16)

Full Marks : 50

The questions are of equal value.

Candidates are required to give their answers in their own words as far as practicable.

Distribution of Marks:

Three Questions	: 10×3 = 30
Internal Assessment	: 10
Attendance	: 10

Answer ***Question No. 1*** and ***any one*** from ***Question Nos. 2, 3, 4*** and ***any one*** from ***Question Nos. 5, 6***.

Throughout the question paper, the symbol R represents the last digit of the University Roll No. of the candidate.

1. Compute $f(x)$ and $f'(x)$ at $x = 6.0 - (R + 2)/200$ from the following table using suitable interpolation formula:

x	$f(x)$
5.00	0.3765103263
5.10	0.3827742822
5.20	0.3891424508
5.30	0.3956165658
5.40	0.4021983898
5.50	0.4088897149
5.60	0.4156923627
5.70	0.4226081853
5.80	0.4296390656
5.90	0.4367869178
6.00	0.4440536879

2. Solve the following system of linear equation by Gauss-Seidel method correct to 4D:

$AX = B$ where $X = (X_1, X_2, X_3, X_4)^T$

and $B =$ (15.655, 22.705, 23.480, 16.110)

$$A = \begin{pmatrix} 3.82 + \frac{R}{10} & 1.02 & 0.75 & 0.81 \\ 1.05 & 4.53 + \frac{R}{10} & 0.98 & 1.53 \\ 0.73 & 0.85 & 4.71 + \frac{R}{10} & 0.81 \\ 0.88 & 0.81 & 1.28 & 3.50 + \frac{R}{10} \end{pmatrix}$$

3. Evaluate the following integral by Trapezoidal rule correct to 4D and verify the result by Simpson's 1/3 rule using 13 ordinates:

$$\int_{0^\circ}^{45^\circ} \left[1.4 \sin\left(\frac{2+R}{10}x\right) + 2.9 \cos\left(\frac{2+R}{10}x\right)\right] dx$$

4. Compute a positive root of the following equation in (2.0, 3.0) correct up to 2D by bisection method and improve it up to 5D by Newton-Raphson method:

$$e^{x \tan x} + x^2 \ln(x+1) = 9.2 - R/10$$

5. Fit a curve of the form $y = a + bx$ to the following data using least square method correct up to 4D:

x	1.2	2.2	3.2	4.2	5.2	6.2	7.2	8.2
y	$3.5 + \frac{1+R}{10}$	$6.5 + \frac{1+R}{10}$	$9.3 + \frac{1+R}{10}$	$12.1 + \frac{1+R}{10}$	$14.3 + \frac{1+R}{10}$	$19.5 + \frac{1+R}{10}$	$23.1 + \frac{1+R}{10}$	$28.1 + \frac{1+R}{10}$

6. Solve the following initial value problem for $x = 0.1(0.1)\ 0.5$ by 4th order Runge-Kutta method correct to 4D:

$$\frac{dy}{dx} = \frac{1.2 + x^2 y + \sin(xy)}{1 + xy^2 + y^4}$$

with $y(0.0) = 1.0 + \frac{R}{10}$.

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