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4 SEM TDC MTMH (CBCS) C 8

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(May/June)

MATHEMATICS

(Core)

Paper : C-8

(Numerical Methods)

Full Marks : 60

Pass Marks : 24

Time : 3 hours

*The figures in the margin indicate full marks
for the questions.*

Use of scientific calculator is allowed.

1. (a) Define truncation error. 1
- (b) Write an algorithm to find the simple interest by using the formula $SI = PNR/100$. 2
- (c) The number $x = 29.56234$ is rounded off to four significant figures. Compute the absolute error and relative error.

1+1=2

(4)

Or

The population of a town is as follows :

Year	x	1971	1981	1991	2001	2011	2021
Population (in lakhs)	y	20	27	29	36	46	51

Estimate the population for the year 2005.

5. Answer any *three* of the following : $5 \times 3 = 15$

(a) Derive general quadrature formula for equidistant interval.

(b) Derive Simpson's $\frac{1}{3}$ rd rule of numerical integration.

(c) Evaluate

$$\int_{-2}^2 \frac{x dx}{5+2x}$$

using trapezoidal rule with five ordinates.

(d) Evaluate

$$\int_0^4 \frac{dx}{1+x^2}$$

using Boole's rule, taking $h = 0.5$.

(e) Evaluate

$$\int_0^1 x^2 dx$$

using mid-point rule (use four sub-intervals).

(5)

6. (a) Describe Euler's method for first-order and first-degree differential equation. 4

(b) Find $y(0.4)$, by Euler's method from the equation

$$\frac{dy}{dx} = -2xy^3, y(0) = 1$$

correct up to four decimal places, taking $h = 0.2$. 6

Or

Using Runge-Kutta method of fourth order, find the numerical solution at $x = 1.2$ for

$$\frac{dy}{dx} = xy, y(1) = 2$$

assume the step length $h = 0.1$.
