B.Tech Odd Semester (CBCS) Exam., December—2016

(Computer Science and Engineering)

NUMERICAL METHODS

(3rd Semester)

Course No. : CSECC–04

Full Marks : 50
Pass Marks : 15

Time : 2 hours

The figures in the margin indicate full marks for the questions

Answer *any* **five** questions

1. *(a)* Solve the following system of equations by Gauss elimination method : 5

$$3x \quad 3y \quad 2z \quad 2$$
$$10x \quad 3y \quad 4z \quad 16$$
$$3x \quad 6y \quad 2z \quad 6$$

(b) Construct the interpolating polynomial for the function $y \quad \sin \quad x$, choosing the points $x_0 \quad 0$, $x_1 \quad \frac{1}{6}$ and $x_2 \quad \frac{1}{2}$. 5

2. *(a)* Compute the relative error in computing $y \quad x^3 \quad 3x^2 \quad x$ for $x \quad \sqrt{2}$, taking $\sqrt{2} \quad 1\ 414$. 4

(b) Find, from the following table, the value of y when $x \quad 1\ 54$ using Newton's backward interpolation formula : 6

x	1·0	1·1	1·2	1·3	1·4	1·5
y	0·24197	0·21785	0·19414	0·17137	0·14973	0·12952

3. *(a)* Compute $y(0 \quad 1)$ by Runge-Kutta method of 4th order for the differential equation

$$\frac{dy}{dx} \quad x \quad y, \; y(0) \quad 1, \; h \quad 0\ 05$$ 5

(b) Evaluate $\int_0^6 \frac{dx}{1 \quad x^2}$ by using Simpson's $\frac{3}{8}$th rule. 5

4. *(a)* State and prove Newton-Raphson formula for finding the real root of an equation $f(x) \quad 0$. 5

(b) Calculate the approximate value of $\int_0^{\frac{\pi}{2}} \sin x \, dx$ by trapezoidal rule using 11 ordinates. 5

5. *(a)* Solve the following by Euler's modified method :

$$\frac{dy}{dx} \quad \log(x \quad y),\ y(0) \quad 2$$

at $x \quad 1\ 2$ with $h \quad 0\ 2$. 5

(b) Derive Lagrange's polynomial interpolation formula for a function $f(x)$ corresponding to the distinct points $x_0,\ x_1,\ \ldots\ldots\ldots,\ x_n$. 5

6. *(a)* By constructing a difference table, find the sixth term of the series, 8, 12, 19, 29, 42, ... 5

(b) Solve the following system of equations, correct to four places of decimals, by Gauss-Seidel method : 5

$$x \quad y \quad 54z \quad 110$$
$$27x \quad 6y \quad z \quad 85$$
$$6x \quad 15y \quad 2z \quad 72$$

7. Describe Runge-Kutta method for numerical solution of ordinary differential equation. 10

8. From Newton-Cotes quadrature formula, deduce the following quadrature rules : 3+3+4=10

(a) Trapezoidal rule

(b) Simpson's $\frac{1}{3}$rd rule

(c) Weddle's rule

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