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

INFORMATION TECHNOLOGY

(3rd Semester)

Course No. : IT303

(Numerical Methods and Programming)

Full Marks : 75
Pass Marks : 30

Time : 3 hours

The figures in the margin indicate full marks for the questions

Answer **five** questions, taking **one** from each Unit

UNIT—I

1. *(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) Briefly describe the concept applied in the bracketing methods used for solving nonlinear equations. 4

(c) Find a real root of the equation $xe^x \quad 2 \quad 0$ correct up to 3 significant figures by Regula Falsi method. 7

2. *(a)* State and prove Newton-Raphson formula for finding the real root of an equation $f(x) \quad 0$. 7½

(b) Find a root of the equation $xe^x \quad \cos x$ using secant method correct to four decimal places. 7½

UNIT—II

3. *(a)* Derive the equation for Newton's general interpolation formula with divided differences. 7½

(b) Construct the interpolating polynomial for the function $y \quad \sin \quad x$, choosing the points

$x_0 \quad 0, x_1 \quad 1/6, x_2 \quad 1/2$ 7½

4. *(a)* Derive Lagrange's polynomial interpolation formula for a function $f(x)$ corresponding to the distinct points $x_0, x_1, \ldots\ldots\ldots\ldots, x_n$. 7

(b) Find from the following table, the value of y when $x \quad 1\ 54$ using Newton's backward interpolation formula : 8

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

UNIT—III

5. *(a)* Describe LU-factorization method for numerical solution of a system of linear equations. 8

(b) Solve the following system by Gauss elimination method : 7

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

6. *(a)* Describe Gauss-Jacobi method for numerical solution of a system of linear equations. 7

(b) Solve the following system of equations, correct to four places of decimals, by Gauss-Seidel method : 8

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

UNIT—IV

7. *(a)* Describe Runge-Kutta method for numerical solution of ordinary differential equation. 8

(b) Solve by Euler's modified method

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

at $x \quad 1\ 2$ with $h \quad 0\ 2$. 7

8. *(a)* State the formula of Euler's method. Illustrate its concept graphically. 7

(b) Compute $y(0\ \ 1)$ by Runge-Kutta method of 4th order for the differential equation

$$\frac{dy}{dx} \quad x \quad y, \quad y(0) \quad 1, \quad h \quad 0\ 05$$ 8

UNIT—V

9. From Newton-Cotes quadrature formula, deduce the following quadrature rules : 5×3=15

(a) Trapezoidal rule

(b) Simpson's 1/3rd rule

(c) Weddle's rule

10. *(a)* Calculate the approximate value of $\int_0^{\frac{2}{}} \sin x\,dx$ by trapezoidal rule using 11 ordinates. Also compare it with the actual value of the integral. 8

(b) Evaluate

$$\int_0^6 \frac{dx}{1 \quad x^2}$$

by using Simpson's 3/8 rule. 7

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