

B.Tech 4th Semester Exam., 2016

NUMERICAL METHODS AND
COMPUTATIONAL TECHNIQUE

Time : 3 hours

Full Marks : 70

Instructions :

- (i) The marks are indicated in the right-hand margin.
- (ii) There are **NINE** questions in this paper.
- (iii) Attempt **FIVE** questions in all.
- (iv) Question No. 1 is compulsory.

1. Answer the following as directed (any seven) :
2x7=14

- (a) When is a matrix said to be rectangular matrix?
- (b) When is an iterative method said to be of order p of convergence?
- (c) What is the convergence of Newton-Raphson method?
- (d) Name the two types of numerical methods for the solution of simultaneous linear algebra equations.
Gauss Seidel iteration, Jacobi's

(Turn Over)

(2)

(e) The Δ symbol is called forward difference operator.

(Fill in the blank)

(f) The differences of the first-order forward differences are called _____. $\Delta(\Delta y) = \Delta^2 y$
(second order forward)

(Fill in the blank)

(g) What is the geometric significance of the trapezoidal rule? $n=1$ higher order more
then 1st order more

(h) What is quadrature?

(i) ~~Loop~~ Loop statements are used to repeat execution of a list of statements.

(Fill in the blank)

(j) The Go to statement is used to transfer control to a specified label.

(Fill in the blank)

2. (a) Find the root of the equation $x \tan x = 1.28$ that lies between 0 and 1, correct to two places of decimals, using bisection method.

(b) Write a computer program using C++ for the above equation using bisection method.

7-7=14

(3)

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3. Find the inverse of the matrix

$$A = \begin{vmatrix} 1 & 3 & 3 & 2 \\ 1 & 4 & 3 & 4 \\ 1 & 3 & 4 & 5 \\ 2 & 5 & 3 & 2 \end{vmatrix}$$

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by Gauss elimination method. 14

4. The population of a town in the census is as given in the following data :

Year (x)	1961	1971	1981	1991	2001
Population (in 1000's)	46	66	81	93	101

Estimate the population in the year 1996 using Newton's (a) forward interpolation and (b) backward interpolation formulas. 7+7=14

5. Fit a curve of the form $xy = a + bx^2$ of the following data by the method of least squares : 14

X	1	2	4	6	8
Y	5.43	6.28	10.32	14.86	19.51

6. The velocity v a particle at distance s from a point on its linear path is given in the following data :

s(m)	0	2.5	5.0	7.5	10.0	12.5	15.0	17.5	20.0
v(m/s)	16	19	21	22	20	17	13	11	9

Estimate the time taken by the particle to traverse the distance of 20 metres, using Simpson's one-third rule. 14

(4)

7. Solve the equation $5x \frac{dy}{dx} + y^2 - 2 = 0$, $y(4) = 1$ for $y(4.1)$ and $y(4.2)$ taking $h = 0.1$, using simple Euler's method and modified Euler's method. 14

8. Solve the equation $\frac{dy}{dx} = \frac{1}{x+y}$, $y(0) = 1$ for $y(0.1)$ and $y(0.2)$, using Runge-Kutta method of the fourth order. 14

9. Solve the equation $y''(x) - xy(x) = 0$ for $y(x_i)$, $x_i = 0, 1/3, 2/3$, given that $y(0) + y'(0) = 1$ and $y(1) = 1$ by using boundary value problem. 14

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