Roll No. | | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 07

B.Sc.(Computer Science) (2013 & Onwards) (Sem.–5)

NUMERICAL ANALYSIS

Subject Code : BCS-501

Paper ID : [72574]

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains SIX questions carrying TEN marks each and students have to attempt ANY FOUR questions.**

SECTION-A

1. Write briefly :

a) Find the inverse of $A = \begin{pmatrix} 1 & 3 \\ 2 & 7 \end{pmatrix}$ by Gauss Jordan method.

b) State Newton's backward formula for interpolation.

c) Describe Newton Raphson method geometrically.

d) Perform two iterations of false position method to obtain a real root of the Equation $x^3 - 2x - 5 = 0$

e) Given $y' = x + y$, $y(0) = 1$, find $y(0.1)$ by Euler's method.

f) Compute the resulting error in $f(x) = x^3$ for given value of $x = 3.42$ with an error of $\Delta x = 0.003$

g) Write the finite difference approximation of $y'(x)$ and $y''(x)$.

h) Prove that $\mu\delta = \frac{1}{2}(\Delta + \nabla)$.

i) Find $\frac{dy}{dx}$ at $x = 0.1$ from the following table :

x	0.1	0.2	0.3	0.4
y	0.9975	0.9900	0.9776	0.9604

j) If

x :	0	0.5	1	1.5	2
$f(x)$:	0	0.25	1	2.25	4

Find the value of $\int_0^2 f(x)\,dx$ by Simpson's 1/3 rule.

SECTION-B

2. a) Find the real root of the equation $3x = \cos x + 1$ correct to four decimal places by Newton Raphson's method.

   b) Determine the value of sin 38°, where the values of x in degrees and sin x are given in the following table :

x	15	20	25	30	35	40
sin x	0.2588190	0.3420201	0.4226183	0.5	0.5735764	0.6427876

3. a) Solve by Triangular method : $2x + 3y + z = 9$; $x + 2y + 3z = 6$; $3x + y + 2z = 8$.

   b) Discuss the rate of convergence of Muller's method.

4. a) Fit the curve $y = ae^{bx}$ to the following data :

x	2	4	6	8
y	25	38	56	84

   b) Solve the differential equation $\frac{dy}{dx} = 1 + xz, \frac{dz}{dx} = -xy$ for $x = 0.3$ using fourth order Runge Kutta method with initial values $x = 0, y = 0$, z = 1.

5. a) Evaluate : $\Delta^4 = (1 - x)(1 - 2x)(1 - 3x)(1 - 4x)$, $h = 1$

   b) Using Newton's forward interpolation formula, show that

$$\sum n^3 = \left(\frac{n(n+1)}{2}\right)^2.$$

6. a) Use Romberge's method to compute $\int_0^1 \frac{dx}{1+x^2}$ correct to 4 decimal.

   b) Using Milne's method find $y(4.4)$ given $5xy' + y^2 - 2 = 0$, such that

   $y(4) = 1$, $y(4.1) = 1.0049$, $y(4.2) = 1.0097$, $y(4.3) = 1.0143$, $y(4.4) = 1.087$

7. a) Apply Bessel's formula to obtain y_{25} given that $y_{20} = 2854$, $y_{24} = 3162$, $y_{28} = 3544$, $y_{32} = 3992$.

   b) If $V = \frac{1}{2}\left(\frac{r^2}{h} + h\right)$ and the error in V is the most 0.4%. Find the percentage error allowable in r and h when $r = 5.1$ cm and $h = 5.8$ cm.