B.E(Electrical, Electronics, Bio-medical and Electronics & Telecommunication) (Sem III) (Rev) Examination October 2006

11-Nov.Exm.-NK-06 22

Numerical Techniques

Con. 4682-06. YM-5194

05/06/06

(REVISED COURSE)

(3 Hours) [Total Marks : 100

N.B. (1) Question No. **1** is **compulsory**.
(2) Answer any **four** questions out of remaining **six** questions.
(3) Make **suitable** assumptions if **required** and **justify** the **same**.
(4) Write **Programs** in **C/C++** .

1. (a) Explain errors arising in Numerical Methods and their propagation. 5
   (b) Find Maximum absolute, relative and percentage error in s, where $s = 10\,pq/r^2$ at $p = q = r = 2$ if error in p,q,r, is 0·005. 3
   (c) Derive Newton-Raphson formula graphically. Write merits and demerits of this method. 5
   (d) Find number of iterations and then root between 9 and 10 of $\sqrt{86}$ with allowable error e = 0·05 using Bisection Method. Also write Algorithm for the same. 7

2. (a) Draw the flowchart and write a program to evaluate N variables from N simultaneous equations using Gauss Elimination Method. 10
   (b) Solve by Gauss Seidel Method :— 10

$$6x + y + 15z = 11$$
$$15x + 8y + 10z = 11$$
$$10x + 15y - 9z = 11$$

3. (a) Define the operators $\Delta, \nabla, \delta, \mu$ and E. Also show that— 10
   (i) $hD = \log_e E$ where $D = d/dx$
   (ii) $\Delta + \nabla = 2\mu\delta$
   (iii) $E = 1 + \Delta$
   (iv) $\upsilon = (1 + \delta^2/4)^{1/2}$.
   (b) Derive formulae for Trapezoidal Rule and Simpson's 1/3 Rule and Compute : 10

$$I = \int_{-2}^{2} \frac{5}{1+x^2}\,dx \quad \text{with } h = 0{\cdot}5 \text{ by above methods.}$$

4. (a) Use Newton's Difference and Differentiation formulae to find y (1·15), y(1·55), $\frac{dy}{dx}$ (1·2) $\frac{dy^2}{dx^2}$ (1·2), and $\frac{dy}{dx}$ (1·6) from the following data :— 10

x	1·1	1·2	1·3	1·4	1·5	1·6
y	3·0041	3·3201	3·6693	4·0552	4·4817	4·9530

   (b) Explain least curve fitting procedure for non linear curve fitting of power function, polynomial of n^{th} order an exponential function. Fit the function of the form $y = ae^{bx}$ to the following data. 10

x	0	0·5	1·0	1·5	2·0	2·5
y	0·10	0·45	2·15	9·15	40·35	180·75

5. (a) Solve the equations by LU Decomposition Method : 10

$$x + y + z = 6$$
$$2x + 3y + 4z = 20$$
$$x + 5y + 2z = 17.$$

   (b) Derive R-K second order formula graphically. Also write a program in C or C++ for the same. 10

6. (a) Solve the Differential equation $\frac{dy}{dx} = x^2 + y$ with y(0) = 1 and h = 0·05, find y(0·05), y (0·1), y(1·15) using Modified Euler's method. 10
   (b) Write a program for Lagrange's Interpolation. Find f(1·18) using Lagrange's Interpolation. 10

x	1·1	1·2	1·4	1·5
y	1·21	1·44	1·96	2·25

7. (a) Derive Newton divided difference formula.. Find f(2) from the values f(1) = 3, f(5) = 31, f(7) = 57, f(8) = 73. Show that the same formula works for evenly spaced points also. 10

(b) Write short notes on (any **two**) :— 10

(i) Linear Regression

(ii) Golden Search Method

(iii) Picard's Method.