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SE-6845

B. E. III (Sem. V) (I.T.) Examination

April / May – 2011

Numerical Methods In Engineering

Time : **3** Hours] [Total Marks : **100**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ **B. E. 3 (Sem. 5) I.T.**

Name of the Subject :

☛ **Numerical Methods in Engineering**

☛ Subject Code No. : **6 8 4 5** ☛ Section No. (1, 2,.....) : **1, 2**

Seat No. :

Student's Signature

(2) Answer to both the section must be written in separate answer books.

(3) Figures to the extreme right indicate maximum marks.

(4) Assume suitable data, if necessary.

(5) Support your answer with neat and clean diagram wherever necessary.

SECTION - I

1 (a) Do as directed : **10**

(1) Let x = 0.005998, then the relative error is x is rounded-off to three decimal digits is _____.

(2) Let x = 0.00458529, then the absolute error is x is truncated to three decimal digits is _____.

(3) Write types of non-linear equations.

(4) Write round off numbers up to 2 decimal places for the following :

(a) 0.667

(b) 4.3743

(c) 8.9954

(5) The base of a number system is also referred to as _____.

(6) _____ method for finding the solution of equation is also known as trial and error method.

(7) Approximate numbers are same as the exact numbers. (true/false)

(8) Define numerical analysis.

(9) In binary number system the base value of a number is power of 2 and place value is 2. (true/ false)

(10) Define absolute and relative error.

(b) How to choose initial approximation for any non-linear equation ? Explain with example. Also write down algorithm and plot a graph. **04**

(c) Define error propagation. Explain error propagation in addition operation and in multiplication operation. **04**

2 Attempt the following questions (any two) **16**

(1) Derive the formula for the Newton's divided difference interpolation, also write down the algorithm.

(2) Derive the formula for Runge-Kutta fourth order method. Find the solution correct to three decimal position in the interval [1, 1.5] for dy/dx=x*y with y(1) = 5.

(3) Using Bisection method, find a real root of the equation "$x - \cos x = 0$". Guess the number of iterations.

3 (a) Find the square root of a 23 correct up to 3 decimal places using Newton-Raphson method. **08**

OR

(a) Find the solution for the equation correct to four decimal. 8

$e^{-x} - \sin x = 0$

Using false position method.

(b) Derive Newton's backward difference interpolation. 08

From the following table of half-yearly premium for policies maturing at different ages, estimate the premium for policy maturing at the age of 63 :

Age:	45	50	55	60	65
Pr*emium* (*in Rs*)	114.84	96.16	83.32	74.48	68.48

SECTION - II

4 (a) Do as directed : 10

(1) Define : Adjoint of a matrix

(2) Define : Sparse matrix

(3) Define : Numerical differentiation

(4) Define : Significant digits

(5) Write the equation for the following.

"Regression line of x on y"

(b) Answer the following : 08

(1) Explain initial value problem and boundary value problem.

(2) Explain the principle of least squares for fitting a curve in detail.

5 Attempt the following questions (any two) **16**

(1) Solve the following equation by Gauss Elimination method

$2x + 4y + z = 3$

$3x + 2y - 2z = -2$

$x + y + z = 4$

(2) Solve the following equation by Jacobi's method

$10x + y + 2z = 13$

$2x + 10y + 3z = 15$

$x + 3y + 10z = 14$

(3) Fit a straight line to the following data :

x:	0	1	2	3	4
y:	1	1.8	3.3	4.5	6.3

6 (a) Find dy/dx at x = 0.1 from the following table : **08**

x:	0.1	0.2	0.3	0.4
y:	0.9975	0.9900	0.9776	0.9604

OR

(a) Using Simpson's 1/3 rule, evaluate the integral. **08**

$$\int_{1.0}^{1.8} \frac{e^x + e^{-x}}{2}$$

(b) Write the algorithm of Trapezoidal Rule for tabulated function. **08**