B.E. Part - II
3rd Semester Final Examination 2011

Time - 3 Hours   Full Marks – 70

Subject: Numerical Analysis and Functional Optimization

Code No   IT 301
Branch IT

Q 1 is compulsory and answer any five from the rest

Q1. Answer any Five   5 X 2 = 10

a) Find out the decimal value of the number stored in IEEE 754 format 32 bit floating point number as follows: - 1001 1111 0000 0000 0000 0000 0000 0000

b) In Newton-Raphson Method we try to solve $x^4 - 2x - 5 = 0$. If the initial guess is 1, what shall be the next value?

c) Is it possible to find complex root of a polynomial by Lin-Bairstow's method? Explain.

d) What is the parameter which is being minimized in least-square method?

e) Express -1234 in 4-digit 10's complement form.

f) Is it possible to solve a second order differential equation by R-K 4 method? Explain.

g) Let us say we get a non-trivial solution for the system of equation of the form AX = 0 when A is an n X n square matrix and X is an n X 1 column vector. Is it possible to have a solution for the equation AX = B where B is not zero?

Q2.

a) Let Z be a complex number. Solve using 2-variable Newton-Raphson method upto two steps the following equation:

$$Z^4 + Z + 1 = 0$$

with initial guess as (1 + i) where i denotes the usual meaning.

b) Certain experimental values of x and y are given below:

x	y
0	-1
2	5
5	12
7	20

If y = a + b x, find approximate values of a and b using Least Square Method.

6 + 6 = 12

Q3

a) Find out the polynomial using Newton's Divided Difference formula using the data from the following table:

X	Y
-1	2
0	1
2	17
3	82
5	626

b) Shall we get the same polynomial if we use Lagrange's method on the same set of data? Explain with reasons.

c) Show that E – 1 is equivalent to finite difference operator.

$$6 + 4 + 2 = 12$$

Q4.

a) Examine the consistency of the following equation:

$2x - 3y = -1$
$3x + y = 4$
$x + 4y = 5$

How many solutions the system of equations will have?

b) Invert the following matrix by Gauss-Jordan method::

1	-1	1
1	-2	4
1	2	2

$$4 + 2 + 6 = 12$$

Q5.

a) The velocities of a car (running in a straight line) at intervals of 2 minutes are given below:

Time (in minutes)	Velocity (in Km / hr)
0	0
2	22
4	30
6	27
8	18
10	7
12	0

Apply Simpson's rule to find the distance covered by the car in meter.

b) The population of a town are as below:

Year	Population (in thousands)
1921	46
1931	66
1941	81
1951	93
1961	101

Estimate the population in the year 1955.

$$6 + 6 = 12$$

Q6.

a) Find the Taylor Series upto the 3rd power of x from the following differential equation:

$dy/dx = x - y^2$ and $y(0) = 1$ and find the value of $y(0.1)$

b) Given $dy/dx = 1/(1+x)$ where $y(0) = 0$. Find $y(0.1)$ and $y(0.2)$ using Runge-Kutta Method and compare with the Analytical Result.

$$5 + 7 = 12$$

Q7.

a) Show that the volume of a parallelepiped is maximum when the sum of three sides is fixed, is a cube. Is it applicable for rectangle also?

b) Let $S = \Sigma\, p_i \ln p_i$ and $\Sigma\, p_i = 1$. Show that using Lagrange's method of undetermined Multiplier for the optimum value of S , all p_i are the same.

$$4 + 2 + 6 = 12$$

Q8.

a) For a pseudo square $x^4 + y^4 = 1$ find out the perimeter and the area.

b) Assuming a matrix satisfies its own characteristic equation, find out the inverse of the following matrix:

1	-2
-2	-2

$$4 + 4 + 4 = 12$$