Roll No. .....

Subject Code—6024

M. Tech. EXAMINATION

(Main/Reappear Batch 2011 Onwards)

(First Semester)

MECHANICAL ENGINEERING

MEL-715

Engineering Mathematics

Time : 3 Hours *Maximum Marks : 70*

Note : Attempt any *Five* questions. All questions carry equal marks.

1. (a) What is a function ? Give example and mention their utility in C. Also give their various features.

   (b) What are Arrays ? Illustrate by writing a program using array. Also demonstrate array initialization.

2. (a) What are Strings ? Explain by giving example. How pointers are related to strings ? Discuss.

(b) Why do we use structure ? Explain how structure elements are stored ?

3. (a) Derive False Position Formula. What is the order of convergence ? Using it find a root of $f(x)=x^2-x-2=0$ in the internal (1, 3) upto three iterations.

(b) Show that Newton-Raphson method has quadratic convergence. Evaluate $(30)^{-1/5}$ using this method correct upto four decimal places.

4. (a) Using quotient-difference method obtain approximate roots of the equation :

$$x^3-x^2-2x+1=0$$

(b) Explain the method of iteration for solution of systems of non-linear equations. Also discuss the convergence condition.

5. (a) Solve the system of non-linear equation :

$$x^2=3xy-7$$

$$y=2(x+1)$$

using Newton's-Raphson method.

(b) Explain Gauss-Seidel Iteration method and its convergence. Using it solve the system of equations :

$$10x + y + z = 12$$

$$2x + 10y + z = 13$$

$$2x + 2y + 10z = 14$$

upto five iterations.

6. (a) Explain the problem of interpolation and using a suitable interpolation formula. For the following data :

% of lead(P) : 40 50 60 70 80 90

Melting Point (T): 180 204 226 250 276 304

find the melting point(T) when percentage (P) is 84, using a suitable interpolation formula.

(b) State Gauss interpolation formula. Using suitable Gauss formula, find the value of sin(0.197) from the following data :

x	:	0.15	0.17	0.19	0.21	0.23
$\sin x$	:	0.14944	0.16918	0.18886	0.20846	0.22798

7. (a) State without proof, Stirling's formula for central interpolation and mention its limitations.

Interpolate the value of $y = e^x$ when $x = 1.91$ from the following data :

x	:	1.7	1.8	1.9	2.0	2.1	2.2
y	:	5.4739	6.0496	6.6859	7.3891	8.1662	9.0250

(b) Using the Lagrange's interpolation formula express :

$$\frac{x^2+6x+1}{(x-1)(x+1)(x-4)(x-6)}$$

as sums of partial fractions.

8. (a) Establish Newton's divided-difference formula. What is the estimate of the remainder term in terms of the appropriate derivative.

Deduce Newton's forward formula as a special case of it.

(b) Explain Hermite interpolation formula. Illustrate its application to an example of your choice.