(Subject Code and Roll No. to be filled in your Answer Book)

Roll No. [⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛]

M.Tech.

(SEM. I) THEORY EXAMINATION 2012–13

NUMERICAL METHODS AND COMPUTER PROGRAMMING

Time : 3 Hours   *Total Marks : 100*

Note :– Attempt any **five** questions of the following. All questions carry equal marks.

1. (a) Using Newton-Raphson method, find a real root of the equation $\sin x = 1 + x^3$.

   (b) Find the real root of the equation $x^3 - 6x^2 + 11x - 6 = 0$ by Graeffe's root square method

2. (a) Using Everett's formula, evaluate $f(25)$ from the following table :

x	20	24	28	32
$f(x)$	2854	3162	3544	3992

   (b) Using Newton's divided difference formula, evaluate $f(8)$ and $f(15)$ given that :

x	4	5	7	10	11	13
$f(x)$	48	100	294	900	1210	2028

3. (a) Find the least squares approximation of second degree for $f(x) = x^4$ in the range $[-1, 1]$ by using chebyshev polynomials.

   (b) Find the polynomial, which take the values as given in the table below by using Gauss's forward difference formula :

x	1	2	3	4	5
y	1	−1	1	−1	−1

4. (a) Solve the system $2x + y + 4z = 12$, $8x + 3y + 2z = 20$, $4x + 11y + z = 33$ by Crout's method.

   (b) Find the eigen values and eigen vectors of the matrix

   $$A = \begin{bmatrix} 5 & 0 & 1 \\ 0 & -2 & 0 \\ 1 & 0 & 5 \end{bmatrix}.$$

5. (a) From the following table the value of x and y, obtain $\dfrac{dy}{dx}$ and $\dfrac{d^2 y}{dx^2}$ for $x = 1.2$,

x	1.0	1.2	1.4	1.6	1.8	2.0	2.2
y	2.7183	3.3201	4.0552	4.9530	6.0496	7.3891	9.0250

   (b) Evaluate $\displaystyle\int_0^{10} \dfrac{dx}{1 + x^2}$ by using (i) Simpson's 3/8 rule (ii) Weddle's rule. Compare the results with actual value.

6. (a) Determine the value of y when $x = 0.1$ given that $y(0) = 1$ and $y' = x^2 + y$ by using Eulers modified method.

   (b) Given that $y' = x^2 - y$, $y(0) = 1$ find $y(0.1)$, $y(0.2)$ using Runge-Kutta fourth order method.

7. (a) Use the predictor-corrector formula solve for $10\dfrac{dy}{dx} = x^2 + y^2$, $y(0) = 1$ for $0.5 \le x \le 1.0$.

   (b) Find the value of sin 54°, it is given that :

x	30	35	40	45	50	55
$\sin x$	0.5000	0.5736	0.6428	0.7071	0.7660	0.8192

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