Registration No. : | | | | | | | | | | |

Total number of printed pages – 2

B. Tech

FESM 6302

Sixth Semester (Special / Back) Examination – 2013

NUMERICAL METHODS

BRANCH : CHEM

QUESTION CODE : E 371

Full Marks – 70

Time : 3 Hours

*Answer Question No. **1** which is compulsory and any **five** from the rest.*
The figures in the right-hand margin indicate marks.

1. Answer the following questions : 2×10

(a) Give an example of a Truncation error.

(b) What is the rate of convergence for Newton-Raphson method ?

(c) Let $f(x) = x^3 - 5x + 1 = 0$. Find the initial approximation using Bisection method in the interval where the smallest positive integer lies.

(d) Find a linear polynomial using Lagrange's interpolation, such that $F(0) = 1$, $f(1) = 3$.

(e) Define Spline interpolation.

(f) Write the error term in Runge-Kutta method of order four.

(g) Using Euler method, find U(0.4) with h=0.2 for the IVP $u' = -2tu^2$, $u(0) = 1$.

(h) Find f[0,1,3], where f(0) = 1, f(1) = 3, f(3) = 55.

(i) Differentiate Secant method and Regula-falsi method.

(j) Define shooting method.

2. (a) Use Regula-falsi method to determine the root of the equation.
$\cos x - xe^x = 0$ 5

(b) Calculate rate of convergence of Secant method. 5

P.T.O.

3. (a) Construct the forward difference table for the following data : 5

$f(0) = 1, f(1) = 4, f(2) = 9, f(3) = 16$

(b) Find a solution of $f(x) = x^3 + x - 1 = 0$ by fixed point iteration method. 5

4. Use the classical Runge-Kutta method of fourth order to find the numerical solution at $x = 0.8$ for $dy/dx = (x + y)^{1/2}$, $y(0.4)=0.41$. 10

Assume the step length $h = 0.2$. Find the error term.

5. (a) Test the convergence of Gauss-Seidel iteration for the system : 5

$2x+y+z=4$

$X+2y+z=4$

$X+y+2z=4$

(b) Using Adam-Bashforth 4th order method, solve the IVP $dy/dx=1/(x+y)$, $y(0)=1$ in the interval $[0,1.5]$. 5

6. (a) Using Romberg's Integration, evaluate $\int_0^1 \frac{dx}{x+1} dx$. 5

(b) Evaluate $\int_0^1 e^{-x^2} dx$ by Simpson's 1/3rd rule with step length $h = 0.1$ 5

7. (a) Compute ln9.2 from ln9.0=2.1972, ln9.5=2.2513, by linear Lagrange's interpolation and determine the error from ln9.2=2.2192(4D) 5

(b) Obtain the cubic Spline approximation for the function defined by the following data : 5

x	0	1	2	3
y	1	2	33	244

8 (a) Apply improved Euler's method to the following IVP choosing $h = 0.2$, $y' = x + y$, $y(0)=0$ 5

(b) Use a multi step method to evaluate $y'=y$, $y(0)=1$ with $h=0.1$ 5