

**3E2014**

Roll No. \_\_\_\_\_

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**3E2014****B.Tech. III Semester (Back) Examination - 2014****Civil Engg.****3CE4(O) Computer Applications Civil Engg.****Time : 3 Hours****Maximum Marks : 80****Min. Passing Marks : 24****Instructions to Candidates:**

Attempt any **five** questions, selecting **one** question from each **unit**. All questions carry **equal** marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.)

**Unit - I**

1. a) What is the strength of the Newton Raphson's method for finding the roots of a non-linear equation and also discuss the limitations of the method.
- b) Find a real root of the equation  $f(x) = x^3 + x^2 - 1 = 0$  by using successive substitution method. **(8+8)**

**OR**

1. a) Write the algorithm for finding the roots of a non-linear equation using successive substitution method.
- b) Find the root of the equation  $xe^x = \cos x$  using the secant method correct upto four decimal places. **(8+8)**

**Unit - II**

2. a) Why pivoting required in Gauss-elimination method? Differentiate between partial and full pivoting.
- b) Solve the system of equations  
 $2x - 3y + 10z = 3;$   
 $-x + 4y + 2z = 20;$  by LU method. **(8+8)**  
 $5x + 2y + z = -12$

**OR**

2. a) Write the algorithm for Gauss-seidal iteration method for linear equation.  
 b) Apply Gauss-Seidal iteration method to solve the equations

$$20x + y - 2z = 17;$$

$$3x + 20y - z = -18;$$

$$2x - 3y + 20z = 25$$

(8+8)

### Unit - III

3. a) What is the importance of curve fitting in Engineering?  
 b) The ordinates of the normal curve are given by the following table:

x:	0.0	0.2	0.4	0.6	0.8
y:	0.3989	0.3910	0.3683	0.3332	0.2897

Evaluate

i.  $y(0.25)$  and  $y(0.62)$

ii.  $y(0.62)$

(4+12)

OR

3. a) Solve the following differential equation:

$$y_{n+2} - 4y_n = n^2 + n - 1.$$

- b) Apply Stirling's formula to compute  $y(12.2)$  from the following table.

$x^0$ :	10	11	12	13	14
$10^5 y$ :	23,967	28,060	31,788	35,209	38,368

(4+12)

### Unit - IV

4. a) Write short note on numerical integration.  
 b) State the assumptions made, and derive the expression for numerical integration using Simpson's  $\frac{1}{3}$  rule.

(4+12)

OR

4. Evaluate  $\int_0^6 \frac{dx}{1+x^2}$ , using

i. Trapezoidal rule,

ii. Simpson's  $\frac{1}{3}$  rule and

iii. Simpson's  $\frac{3}{8}$  rule. Also finding the true value of the integral, compare the errors in the above three cases. (16)

**Unit - V**

5. a) Apply Runge-Kutta fourth order method to find an approximate value of  $y$  when  $x=0.2$  given that  $\frac{dy}{dx} = x + y$  and  $y = 1$  when  $x = 0$ .

b) Find  $y$  at  $x=0.1$  by Euler's method with five steps, given  $\frac{dy}{dx} = \frac{y-x}{y+x}$  with  $y=1$  for  $x = 0$ . (8+8)

**OR**

5. Solve the equation  $\nabla^2 u = -10(x^2 + y^2 + 10)$  over the square with sides  $x = 0 = y$ ,  $x=3=y$  with  $u = 0$  on the boundary and mesh length = 1. (16)