C 22573 (Pages : 3) Name.....

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2014 SCHEME) EXAMINATION, APRIL 2017

Civil Engineering

CE 14 606—COMPUTER APPLICATION AND OPERATION RESEARCH

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **eight** *questions.*
Each question carries 5 *marks.*

1. Find a real root of the equation $x^3 - 2x - 5 = 0$ by bisection method.
2. Find a root of the equation $x - \cos x = 0$ by Newton Raphson method.
3. Solve the system of equations $5x - 2y + z = 4$, $7x + y - 5z = 8$, $3x + 7y + 4z = 10$ by Gauss elimination method.
4. Find by power method, the larger eigen-value of the matrix $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$.
5. The following table gives the viscosity of an oil as a function of temperature. Use Lagrange's formula to find viscosity of oil at a temperature of 140° :

Temp°	:	110	130	160	190
Viscosity	:	10.8	8.1	5.5	4.8

6. Using Taylor's series method, compute y (0.2) to three places of decimal form $\frac{dy}{dx} = 1 - 2xy$ given that $y(0) = 0$.
7. Find an approximate value of $\log_e 5$ by calculating to 4 decimal places, by Simpson's $\frac{1}{3}$rd rule, $\int_0^5 \frac{dx}{4x+5}$, dividing the range into 10 equal parts.
8. Find the maximum value of y from the following table :—

x	:	0	1	2	3	4	5
y	:	0	0.25	0	2.25	16	56.25

9. Obtain an initial basic feasible solution to the following transportation problem :—

		A	B	C	D	Availability
Source	I	21	16	25	13	11
	II	17	18	14	23	13
	III	32	27	18	41	19
Requirement		6	10	12	15	

10. A firm plans to begin production of three new products on its three plants. The unit cost of producing i at plant j is as given below. Find the assignment that minimizes the total unit cost :

		Plant		
		I	II	III
Product	A	10	8	12
	B	18	6	14
	C	6	4	2

(8 × 5 = 40 marks)

Part B

Answer **all** *questions.*
Each question carries 15 *marks.*

11. A (a) Find a real root of the equation $x^3 + x^2 + x + 7 = 0$ by Regula-Falsi method correct to four decimal places.

(b) Solve the equations $27x + 6y - z = 85$, $x + y + 54z = 110$, $6x + 15y + 2z = 72$ by Gauss-Seidel method.

Or

B (a) Solve the following equations by LU decomposition method :

$2x + 3y + z = 9$, $x + 2y + 3z = 6$, $3x + y + 2z = 8$.

(b) Explain the relevance of matrix methods in structural analysis.

12. A (a) Using Gauss's forward formula, evaluate $f(3.75)$ from the table :

x :	2.5	3.0	3.5	4.0	4.5	5.0
y :	24.145	22.043	20.225	18.644	17.262	16.047

(b) From the following table, find y when x = 1.07 and 2.25 by Newton's interpolation formula :

x :	1	1.4	1.8	2.2	2.6
$f(x)$:	3.49	4.82	5.96	6.5	7.71

Or

B (a) Find the cubic splines for the following table of values :

x :	1	2	3
y :	− 6	− 1	16

Hence evaluate y (1.5) and y' (2).

(b) Using Jacobi's method, find all the eigen values and the eigen vectors of the matrix :

$$A = \begin{bmatrix} 1 & \sqrt{2} & 2 \\ \sqrt{2} & 3 & \sqrt{2} \\ 2 & \sqrt{2} & 1 \end{bmatrix}.$$

13. A (a) Using three point Gaussian quadrature formula, evaluate $\int_2^4 (1+x^4)\,dx$.

(b) Using Runge-Kutta method of order 4, compute y (0.2) and y (0.4) from $10\frac{dy}{dx} = x^2 + y^2$, $y(0) = 1$ taking $h = 0.1$.

Or

B (a) Using Euler's method solve for y at $x = 0.1$ from $\frac{dy}{dx} = x + y + xy$, $y(0) = 1$ taking step size $h = 0.025$.

(b) Solve the boundary value problem $y'' - 64y + 10 = 0$ with $y(0) = y(1) = 0$ by the finite difference method. Compute the value of $y(0.5)$ and compare with the true value.

14. A (a) Using Simplex method, solve the following LPP :

Maximize $Z = 4x_1 + 10x_2$

subject to
$$\begin{aligned} 2x_1 + x_2 &\le 50 \\ 2x_1 + 5x_2 &\le 100 \\ 2x_1 + 3x_2 &\le 90 \\ x_1, x_2 &\ge 0. \end{aligned}$$

(b) Write a short note on limit design of steel portal frames.

Or

B (a) Explain the terms (i) degeneracy ; (ii) duality.

(b) How is the cross over operation performed in genetic algorithms ?

(c) What is the purpose of mutation ? How is it implemented in genetic algorithms.

(4 × 15 = 60 marks)