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ET-302(A)

B.Tech. Civil (Construction Management)/
B.Tech. Civil (Water Resources Engineering)

Term-End Examination

00873 **June, 2018**

ET-302(A) : COMPUTER PROGRAMMING AND NUMERICAL ANALYSIS

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any* ***five*** *questions. All questions carry equal marks. Use of scientific calculator is permitted.*

1. (a) Solve the following system of linear equations by Gauss elimination method :

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

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

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

(b) Solve the following system of linear equations by Gauss-Seidel iterative method : 7+7

$$2x + y + z = 4$$

$$x + 2y + z = 4$$

$$x + y + 2z = 4$$

2. (a) Find the approximate value, correct to three places of decimals of the real root which lies between – 2 and – 3 of the equation

$$x^3 + 3x + 4,$$

using the method of false position three times in succession.

(b) Find the real root of the equation

$$x^4 - x - 9 = 0$$

by Newton-Raphson method, correct to three places of decimal. 7+7

3. (a) Using Newton's forward interpolation formula, find y at x = 8 from the following table :

x :	0	5	10	15	20	25
y :	7	11	14	18	24	32

(b) Using Lagrange's interpolation formula, find the values of y when x = 10, from the following table : 7+7

x :	5	6	9	11
y :	12	13	14	16

4. (a) Evaluate

$$\int_0^1 \frac{1}{1+x^2}\,dx,$$

using Simpson's rule taking $h = \frac{1}{4}$. Hence compute an approximate value of π.

(b) Find a real root of the equation

$$x^3 - x - 11 = 0,$$

correct to 3 decimal places using Bisection method. 7+7

5. (a) Solve the following system of linear equations by Jacobi iteration method :

$$8x - 3y + 2z = 20$$

$$4x - 11y - z = 33$$

$$6x + 3y + 12z = 35$$

(b) Use Runge-Kutta method to find y when $x = 1{\cdot}2$ in steps of $0{\cdot}1$, given that

$$\frac{dy}{dx} = x^2 + y^2 \text{ and } y(1) = 1{\cdot}5.$$ 7+7

6. (a) Write a FORTRAN program to compute cosine series, i.e.

$$\cos(x) = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \ldots + \frac{x^n}{n!}.$$

(b) Write a FORTRAN program to find out whether a year (entered in 4-digit number representing it) is a leap year. 7+7

7. (a) Given three numbers A, B and C, write FORTRAN programme to write values in descending order.

(b) Two one-dimensional arrays C and D have 25 elements each. Write a FORTRAN program to compute and print the following quantities :

$$B = \sum_{i=1}^{25} (C_i - D_i)^2$$ 7+7

8. (a) Write a FORTRAN program to calculate and print the roots of a quadratic equation

$$Ax^2 + Bx + C = 0.$$

(b) Write a FORTRAN program and print the values of f(x) given by

$$f(x) = \frac{x^2 + 1{\cdot}5x + 5}{x - 3}$$

for x = – 10 to 10.

(x should take values – 10; – 8; – 6; ... 6, 8, 10)

7+7