

[This question paper contains 6 printed pages.]

1014

Your Roll No.

B.Sc. (Hons.) / II

C

ELECTRONIC SCIENCE – Paper 2.7 (XIV)

(Numerical Analysis)

Time : 3 Hours

Maximum Marks : 38

*(Write your Roll No. on the top immediately
on receipt of this question paper.)*

*Attempt any Five questions in all, including
Question No. 1 which is compulsory.*

Use of non-programmable scientific calculator is allowed.

1. Attempt any five of the following :

(a) Write the FORTRAN expressions corresponding to each of the following :

(i) $\frac{e^{x-1}}{y_1 + \cos x}$

(ii) $\frac{10^{-6}p}{q(d-r)} + \frac{1}{2}S^3$

(iii) $(4x + 3)(3y + 2z - 4)$

(iv) $\sqrt{|\sin(a - b)|}$

P.T.O.

(b) Locate errors, if any in each I/O FORMAT pair

(i) Read (*, 10) A, B, J, K, L

10 FORMAT (3F8.1, 2I8)

(ii) WRITE (*, 20), A, B, N

20 FORMAT (F10.2, 3X, I8, 5X, 16)

(c) Find the value of K after each FORTRAN Program segment is executed

(i) K = 2

100 DO 200 I = 3, 8, 2

IF (I.EQ.5) GO TO 200

K = K + 1

200 CONTINUE

K = 5 * K

(ii) I = 1

J = 1

K = 1

15 IF (J - 10) 10, 25, 25

20 I = I + J

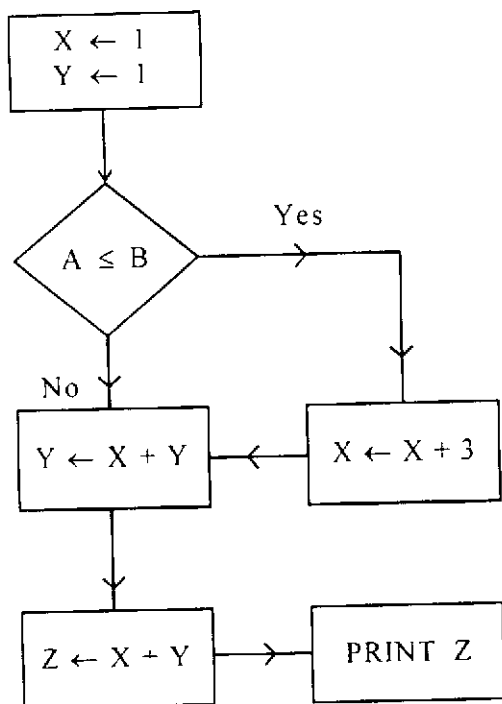
J = J + 1

GO TO 15

25 STOP

END

(d) Translate the following flow chart into FORTRAN segment



(e) Verify whether the following are valid or unacceptable expression. If not correct them.

- (i) IF (5 ≤ B) THEN B = 5
- (ii) DIMENSION. A(30, 40). B(55),
- (iii) IF(10, 20, 30) B
- (iv) DATA, X, Y, Z | 4.0, 5, 6|

(f) Explain inherent error, truncation error and round off error in numerical computation. (2×5)

2. (a) Write a FORTRAN program to calculate and print the value of $\sin x$, correct upto four decimal places using the series

$$\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \dots \quad (4)$$

(b) Write a FORTRAN program to print all the odd numbers less than 500 and divisible by 9. (3)

3. (a) Write a FUNCTION subprogram for adding or subtracting to two $m \times n$ matrices. (3)

(b) Write a FORTRAN program to arrange a one dimensional array in ascending order and print the maximum and minimum of given n numbers. (4)

4. (a) Describe the Bisection method to solve the polynomial equation $f(x) = 0$. Write the algorithm or FORTRAN program for the same. (4)

(b) Obtain any one root of the following equation correct upto three decimal places using false position (Regula Falsi) Method.

$$x^3 - x^2 - 1 = 0 \quad (3)$$

5. (a) Write an algorithm or FORTRAN program for Gauss Elimination method to solve n simultaneous linear equations in n unknowns. (4)

- (b) Solve the following equations by Gauss-Siedal iterative method correct upto three significant digits

$$\begin{aligned}x + 2y + z &= 8 \\2x - y + 2z &= 6 \\3x + 2y - z &= 4\end{aligned}\quad (3)$$

6. (a) Given the following table of values

x	0.4	0.5	0.7	0.8
$f(x)$	-0.916	-0.693	-0.357	-0.223

Estimate the value of $f(0.6)$ using Lagrange's interpolation. What order of polynomial would you use in above interpolation. (3)

- (b) Evaluate the integral using $1/3$ Simpson's rule of integration with 10 points.

$$I = \int_0^5 e^{-x^2} dx \quad (4)$$

7. (a) Describe the 4th Order Runge Kutta method for solving a first order differential equation

$$\frac{dy}{dx} = f(x, y)$$

when $y(x_0) = y_0$ is given. (4)

(b) Solve the following differential equation using Euler's method

$$5 \frac{dy}{dx} = 3x^3 y$$

given $y(0) = 1$

for the interval $0 \leq x \leq 1$ (3)