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Your Roll No. ....

6738

B.A./B.Sc. (Hons.)/II **D**

MATHEMATICS—Unit VIII

(Numerical Analysis and Computer Programming)

Time : 2 Hours *Maximum Marks : 30*

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

There are four sections.

All questions are compulsory.

Assume the data, if missing.

Section I

1. (*a*) Rewrite the following after correcting the errors (if any) :

(*i*) READ (X,*) I*J, A

(*ii*) X + Y = Z

P.T.O.

(*b*) Write the equivalent fortran expression for the following :

$$\sqrt{\sin x} + \log (a + b) + |\tan^{-1} t| . e^{-}$$

(*c*) Evaluate the expression :

I + J.NE.K*L. AND..NOT. m. GT. 3. OR.K.LT. 2

when I = 4, J = 3, K = 2, L = 8 and M = 5

(*d*) Given FORTRAN program segment

```
      DO 10 I = 1, 5
10    A(I) = 6 - I
```

Write equivalent program segment using IF and GO TO statements.

1+1+1+1=4

2. (*a*) What are different rules of writing Do loop ? Correct the errors, if any, in the following Do loops :

```
DO 5 I = 1, 3

Do 10 J = 5, 1

............

5 CONTINUE

10 CONTINUE
```

(*b*) Write a FORTRAN program to compute the sum :

1½+2=3½

$$1/\sqrt{2} + 1/\sqrt{3} + 1/\sqrt{4} + \ldots + 1/\sqrt{9}.$$

Or

(*a*) Give the FORTRAN format for one-dimensional and two-dimensional arrays.

(*b*) Write a FORTRAN program that goes on reading values for an integer variable N until the value read is zero or negative. For each positive value of N read, the program tests whether N is prime number or not. 1+2½=3½

Section II

3. Define rate of convergence of an iterative method. Find the rate of convergence of the following interative method :

$$X_{n+1} = \frac{1}{2}\left(X_n + \frac{a}{X_n}\right)$$

where $a > 0$. 4

4. Use Newton-Raphson method to obtain $\sqrt{48}$ correct upto three places of decimal. Can we apply the secant method to obtain $\sqrt{48}$? Explain. 3½

Or

Use method of false position to obtain root of

$$\cos x - x\, e^x = 0$$

lying in the interval [0, 1]. 3½

Section III

5. Prove that if A is a strictly diagonally dominant matrix, then the Gauss-Seidel iteration scheme converges for any initial starting vector. 4

6. Solve the equations :

$$x + y + z = 6$$

$$3x + (3 + a)y + 4z = 20$$

$$2x + y + 3z = 13$$

Using the Gauss elimination method, where a is small such that $1 \pm a^2 = 1$,

Or

Find the inverse of the coefficient matrix of the system : 3½

$$\begin{bmatrix} 2 & 1 & 3 \\ 4 & -3 & 5 \\ -3 & 2 & 4 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ -7 \\ -3 \end{bmatrix}.$$

Section IV

7. (*a*) For the following tabular values of $f(x)$ and $f'(x)$, estimate the value of $f(x)$ at :

(*i*) X = 0.5 and

(*ii*) $x = -0.5$

using Hermite interpolating polynomial :

x :	-1	0	1
$f(x)$:	1	1	3
$f'(x)$:	-5	1	7

4

(*b*) Define the forward and central difference operators, Δ and δ and prove that :

$$\Delta = \frac{\delta^2}{2} + \sqrt{1} + \frac{\delta^2}{4}$$

Or

The population of a country in the decennial census were as under. Estimate the population for the year 1975 using backward difference interpolating polynomial.

Year	Population (in lacs)
1941	46
1951	67
1961	83
1971	95
1981	102

3½