2 0 1 8

(CBCS)

(5th Semester)

MATHEMATICS

EIGHTH (C) PAPER [MATH–354 (C)]

(Computer Programming in FORTRAN)

Full Marks : 75

Time : 3 hours

(PART : A—OBJECTIVE)

(*Marks* : 23)

The figures in the margin indicate full marks for the questions

SECTION—A

(*Marks* : 8)

Each question carries 1 mark

Tick ☑ the correct answer in the box provided : 1×8=8

1. Which one is the correct integer constant?

(a) 994–1 ☐

(b) 78455 ☐

(c) 12345 ☐

(d) 23·001 ☐

2. A step-by-step procedure to solve a problem is called

(a) flowchart ☐

(b) algorithm ☐

(c) array ☐

(d) loop ☐

3. MOD (180, 3) is equal to

(a) 0 ☐

(b) 1 ☐

(c) 2 ☐

(d) 3 ☐

4. A program which will read two-dimensional array B with array of 10 rows and 20 columns in row-wise is

(a) READ(*, *)((B(I, J), J=1, 20), I=1, 10) ☐

(b) READ(*, *)((B(I, J), I=1, 10), J=1, 20) ☐

(c) READ(*, *)((B(I, J), J=1, 10), I=1, 20) ☐

(d) READ(*, *)((B(I, J), I=1, 20), J=1, 10) ☐

5. The correct form of arithmetic IF statement is

(a) IF(n1, n2, n3, ..., nm), i ☐

(b) IF(J), 10, 20, 30 ☐

(c) IF(D*J) 11, 22, 33 ☐

(d) IF(I*K) 11, 22, 33 ☐

6. The general form of computed GOTO statement is

(a) GOTO n ☐

(b) GOTO(n1, n2, n3, ..., nm)i ☐

(c) GOTO(n1, n2, n3, ..., nm), i ☐

(d) GOTO i, (n1, n2, n3, ..., nm) ☐

7. Choose the invalid FORTRAN statement.

(a) IF(N.LT.0)Y=2.3 ☐

(b) DO 10 J=1.13 ☐

(c) IF (D) 11, 22, 33 ☐

(d) WRITE(*,*) “123=X” ☐

8. Which one is valid DIMENSION statement?

(a) DIMENSION A(I,J) ☐

(b) DIMENSION, A(10,10), B(6) ☐

(c) DIMENSION A(20), C(10) ☐

(d) DIMENSION A(10,10), B(6) ☐

SECTION—B

(*Marks* : 15)

Each question carries 3 marks

Answer *any* **five** questions

1. Translate the following FORTRAN arithmetic expressions into mathematical expressions :

(a) SQRT (SIN ((1.+X**2)**2)+1.)

(b) A*3+B**3+C**3+3.*A*B*–3

2. Write a program to find the distance between two points (x_1, y_1) and (x_2, y_2).

3. Write one 'computed GOTO' statement to replace the following logical IF statements :

```
IF (K.EQ.1) GOTO 55
IF (K.EQ.2) GOTO 7
IF (K.EQ.3) GOTO 85
IF (K.EQ.4) GOTO 51
```

4. Write the following program segment in only three statements :

```
21    J=J + 1
      IF (I.GT.J) GOTO 26
      GOTO 21
26    I=I+1
```

5. Write a program which will read a matrix B with two-dimensional arrays of m rows and n columns in row-wise using implied DO notation.

6. What will be the value of L at the end of the following program?

```
      L=3
1     L=L/4*4.+L
      IF(L.GE.7)STOP
5     L=L–1
      IF(L–3*L/4)1,5,4
4     L=L–1
      WRITE(*,*)L
      END
```

7. Write a program to find the curved surface area of a cylinder using subroutine subprogram.

8. Write a simple but complete programme illustrating the use of arithmetic statement functions.

(PART : B—DESCRIPTIVE)

(*Marks* : 52)

Each question carries 13 marks

Answer **four** questions, selecting **one** from each Unit

UNIT—I

1. *(a)* Draw an algorithm and flowchart to find the GCD of any two positive integers. 3+3=6

(b) Write the general form of DATA statement. What will be the values of A and B from the following statements? 2+2=4

(i) DATA A,B/25.2,19.8/

(ii) DATA A,B/2*3.7/

(c) What are the values of I and J in the following arithmetic statement, if J=1, K=3? 3

```
I=J*2/3 + K/2 + 6 – J*3/8
J=I + K
```

2. *(a)* If I=J=1; what values the following logical expressions have? 3

((I.GT.0).AND.(J.LT.0)).OR.(.NOT.(J.GT.0).AND..NOT.(I.LT.0))

(b) Write short notes on any *two* of the following : 2+2=4

(i) Complex variable

(ii) Double-precision statement

(iii) Logical variable

(c) Write a flowchart to find factorial of a positive integer n>1. Also write a complete FORTRAN program for this. 2+4=6

UNIT—II

3. *(a)* The sum of the squares of the first n natural numbers is given by

$$\text{sum} = \frac{n(n \quad 1)(2n \quad 1)}{6}$$

Write a FORTRAN program to find the sum. 4

(b) Write the general form of IF-THEN-ELSE statement. Suppose the value of Y is given by the equation

$$Y \quad \begin{array}{ll} x^5 & , \text{ if } x \quad 3 \ 0572 \\ x^3 \quad 3x \quad 4 & , \text{ if } x \quad 3 \ 0572 \end{array}$$

Write FORTRAN program to evaluate Y using IF-THEN-ELSE statement. 2+3=5

(c) Write a program to find the sum of digits of a five-digit number using DO loop. 4

4. *(a)* N is said to be a prime number, if its only divisors are 1 and itself. Write a FORTRAN program using 'DO loop' that reads an integer $N \quad 2$ and determine if N is a prime by testing, if N is divisible by any of the integers 2, 3, ... $N / 2$. 4

(b) Write the general form of DO statement. Correct the following program segments : 1+2+2=5

(i)

```
      IF (N.LE.9) GOTO 25
      DO 20  I=1, 50
         X=N*10
25    SUM=SUM+X
20    CONTINUE
```

(ii)

```
IF (N.LT.10) GOTO 20
DO 20 I=1,40
   SUM=SUM+I
20 CONTINUE
```

(c) Write a FORTRAN program in two ways using—*(i)* 'logical if' statement, *(ii)* 'arithmetic if' statement, that reads the coefficients A, B (A 0) of the linear equation AX B 0 and computes its root, when it is positive and gives appropriate message when it encounters a negative root. 2+2=4

UNIT—III

5. *(a)* In the following matrix

$$A \quad [A_{ij}] \quad \begin{matrix} 2 & 3 & 4 \\ 1 & 2 & 3 \\ 6 & 7 & 8 \end{matrix}$$

(i) What are the values of i and j in case of the element '4'?

(ii) Write the print statement in FORTRAN to display all the elements of A. 1+3=4

(b) Write a program to find the product of two matrices. 5

(c) Write a program to arrange the numbers in ascending order. 4

6. *(a)* A Fibonacci sequence is defined as follows :

The first term and the second term of the sequence are 0 and 1. The third and subsequent terms in the sequence are found by adding the preceding two terms of the sequence. A part of the sequence is 0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ...

Write a program to obtain the first 200 terms of this sequence. 7

(b) Economic order quantity may be calculated from the equation $Q \quad \sqrt{\frac{2RS}{I}}$, where R is the yearly requirement, S the setup cost and I the carrying cost per item. The values of R, S and I for 15 items in a factory are given. Write a program using DO loop and subscripted variables to calculate the economic order quantity for each of the items. 6

Unit—IV

7. *(a)* Write a function subprogram to find the factorial of n. Also write a main program to call this function and evaluate ${}^{n}C_{r}$, where ${}^{n}C_{r}$ $\frac{n!}{r!(n \quad r)!}$.

3+3=6

(b) The following is the relationship between the rectangular coordinates (x, y) and the polar coordinates $(r, \ )$ of a point

$$x \quad r\cos \ , \quad y \quad r\sin$$

Write a 'subroutine subprogram' to convert rectangular coordinates of a point to its polar coordinates. Call this subroutine in a main program that reads the values of x and y and prints out both the rectangular and the polar coordinates for the point. 3+4=7

8. *(a)* A function $f(x)$ is defined as follows :

$$f(x) \quad \begin{array}{ll} x \quad 3, & \text{if} \quad x \quad 3 \\ 3x \quad 1, & \text{if} \quad 3 \quad x \quad 3 \\ 2x, & \text{if} \quad x \quad 3 \end{array}$$

Write a function subprogram to evaluate the function. Also write a main program which will compute the value of $2f(x) \quad [f(x)]^2$. 5

(b) Write a subroutine to find the roots of a quadratic equation $ax^2 \quad bx \quad c \quad 0$. Also write a main program to call this subroutine.

4+4=8

★ ★ ★