M.Sc. 1st Semester Examination, 2012

PHYSICS

PAPER — PHS- 103(A + B)

Full Marks : 40

Time : 2 hours

The figures in the right hand margin indicate marks

Candidates are required to give their answers in their own words as far as practicable

Illustrate the answers wherever necessary

Write the answers to questions of each Group in separate books

GROUP — A

[*Marks* : 20]

Time : 1 hour

1. Answer any *three* bits :   2 × 3

    (*a*) What main technology is used in third generation computer ? What was the most significant development in software in the third generation computer ?

(b) Write Fortran arithmetic statement for

$$A \times \sin(a - 0 \cdot 6 \times \pi) + 2\frac{c \times d}{e \times f} + g$$

(c) Write the algebraic expression corresponding to the following Fortran statement

$$C = A * B/(C + D**F/G + H) + E$$

(d) Explain Random Access Memory. Compare it with read only memory.

(e) What are the differences between function subprogram and subroutine subprogram ?

2. Answer any *one* bit :   4

(a) Write the output of the following program

         M = 0
         N = 0
         DO 20 I = 1 , 3
         M = M + I
         DO 10 J = 1, 2

(*Continued*)

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       N = N + J
       If (N.GT.6) GO TO 20
10     CONTINUE
20     CONTINUE
       WRITE (*, 30) M, N, I, J
30     FORMAT (4I5)
       STOP
       END
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(b) Write a FORTRAN program to find the time of fall of a body in free space. The input parameters are the height of fall 'h' and the acceleration due to gravity 'g'.

3. Answer any *one* bit :   10

(a) A function is defined as follows :

$$f(x) = \begin{cases} \sin x & 0 \le x \le 1 \\ x^2 + |x| & 1 \le x \le 2 \\ 2x - \log(x) & 2 < x \le 4 \end{cases}$$

Write a FORTRAN program to find values of $f(x)$ for $0 \le x \le 4$ at intervals of 0·2. ·

(b) Write a program in FORTRAN to find the sum and average of N numbers.

GROUP — B

[*Marks* : 20]

Time : 1 hour

Answer any **four** questions   5 × 4

1. Establish Simpson's $\frac{1}{3}$ rule to integrate
    $$\int_a^b f(x)dx.$$

2. Find by Newton-Rapson method the real root of

    $3x - \cos x - 1 = 0.$

3. Solve the following equations

    $$x_1 + x_2 + x_3 = 4$$
    $$2x_1 - x_2 + 3x_3 = 1$$
    $$3x_1 + 2x_2 - x_2 = 1$$

    by Matrix inversion method.

4. Find the greatest eigen-value and the corresponding
    eigen-vector of the matrix

    $$A = \begin{bmatrix} 4 & 0 & 2 \\ 0 & -1 & 0 \\ 2 & 0 & 4 \end{bmatrix}.$$

5. Find by the method of least squares a formula of the type $y = a + bx$ which will fit the following data

x	2	4	6	8	19	12
y	7·32	8·24	9·20	10·19	11·01	12·05

6. Evaluate $y(1·3)$ using Range-Kutta method of order four for the following initial value problem

$$\frac{dy}{dx} = x^2 + y^2, \quad y(1) = 0.$$

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