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SB-3519

M. Sc. (Part - II) Examination

March / April – 2011

Physics : Paper - III

(Specialization : Theoretical Physics)

(Computer Applications in Physics)

Time : **3** Hours] [Total Marks : **70**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ **M. Sc. (Part - 2)**

Name of the Subject :

☛ **Physics : Paper - 3**

☛ Subject Code No. : **3 5 1 9** ☛ Section No. (1, 2,.....) : **1&2**

Seat No. :

Student's Signature

(2) Use separate answer book for each section.
(3) Symbols used have their usual meaning.
(4) Figures to the right indicate full marks.

SECTION - I

1 (a) Why Computer is so powerful ? **3**

(b) Differentiate between CISC and RISC. **4**

(c) Explain the usage of these commands in Linux with example : **4**

(i) mv (ii) cp

(iii) who (iv) rm.

2 (a) Discuss the mathematical, other functionality and warning messages of Mathematica packages. **7**

(b) Explain the usage of the following commands in DOS : **3**

(i) cls (ii) cd.. (iii) del

(c) Explain the meaning of the following variables in Mathematica : **2**

(i) 3x (ii) x^3y

OR

2 (a) What do you mean by operating system ? Explain the functions and characteristics of different types of operating systems. 7

(b) By taking proper example, explain the following functions to convert different forms of algebraic expressions in Mathematica :
Simplify (expr)
Together (expr)
Power Expand (expr) 3

(c) Explain the meaning of following evaluation functions in Mathematica :
(i) N (expr)
(ii) N (expr, n) 2

3 (a) Explain in detail the internal architecture and the algorithms of Mathematica. 7

(b) Explain the meaning of the following functions in Mathematica :
(i) D [f, x_1, x_2....]
(ii) Dt [f]
(iii) Dt [f,x] 3

(c) Explain the meaning of the following commands in Mathematica :
(i) Plot [f, {x, xmin, xmax}]
(ii) Plot [{ {f_1, f_2....}, {x, xmin, xmax}] 2

OR

3 (a) By taking proper example, explain the Relational and Logical operators in Mathematica. 7

(b) Write a program in Mathematica, which calculates the decay constant, half life time and mean life time of radioactive particles. 3

(c) Explain the meaning of the following brackets in Mathematica :
(i) { }
(ii) [[ ]]. 2

SECTION - II

4 (a) Give an example of physics in each case involving solution of differential equation, integration, interpolation, eigenvalue problem. 4

(b) Mention two obsolete features of FORTRAN77 which are not included in FORTRAN 90. 2

(c) Discuss the advantages of Monte Carlo method of evaluation of numerical integration. 2

(d) What is meant by parallel computers ? List some of the important features. **3**

5 (a) Describe the Cooley-Tukey algorithm for FET. **4**

(b) What is meant by improper integrates ? Discuss a method for evaluation of such integrals. **3**

(c) Use power method to find the highest eigenvalue and the corresponding eigen vector for the matrix **5**

$$\begin{bmatrix} 1 & \sqrt{2} & 2 \\ \sqrt{2} & 3 & \sqrt{2} \\ 2 & \sqrt{2} & 1 \end{bmatrix}$$

OR

5 (a) What is the difference between polynomial interpolation and spline interpolation ? **4**

(b) Explain Richardson's extrapolation method. **3**

(c) Using Romberg's integration method, find the value of $\int_1^{1.8} f(x)dx$ starting with trapezoidal rule, for the tabular values : **5**

x :	1.0	1.2	1.4	1.6	1.8
$f(x)$:	1.543	1.811	2.151	2.577	3.107

6 (a) Distinguish between temporal parallelism and data parallelism with the help of an example. Discuss advantages and disadvantages in each case. **5**

(b) Describe FORALL Statement in FORTRAN 95. **2**

(c) Write a FORTRAN subprogram to evaluate temperature of a classical gas in Molecular Dynamics simulation after equilibrium has been reached. **5**

OR

6 (a) Discuss the CASE construct in FORTRAN 90/95. Give an example. **3**

(b) What is pipelined parallel computer ? **4**

(c) Discuss an algorithm for simulation of a one-dimensional time-independent quantum-mechanical problem. **5**
