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SB-3514

M. Sc. (Part - II) Examination

March / April – 2011

Physics : Paper - I

(Numerical Analysis and Computer Programming)

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 - 1**

☛ Subject Code No. : **3 5 1 4** ☛ Section No. (1, 2,.....) : **1&2**

Seat No. :

Student's Signature

(2) Assume data if required.

(3) Answers to the two sections must be written in separate answer books.

(4) Symbols used have their usual meaning.

(5) Figures to the right indicate full marks.

SECTION-I

1 (a) Explain predictor-corrector method for solution of first order ordinary differential equation. **3**

(b) What is the role of interpolation in numerical evaluation of definite integrals ? Explain. **2**

(c) What are the basic components of a digital computer ? Explain with the help of a block diagram. **3**

(d) Find the value of x at the end of each of the following statements : **3**

float $x = 4.0, y = 12.0, z = 3.5;$

$x+ = 3.0;$

$3* = y;$

$x\% = y + z;$

2 (a) Explain the Jacobi method for solution of eigen value problem and derive an expression for the angle used in the rotation matrix. **5**

(b) State Simpson's $3/8^{th}$ rule and Weddle rule formulae for numerical integration. **2**

(c) Using the method of least squares find an equation of the form y = mx+c that fits the following data : **5**

x:	-2	-1	0	1	2
y:	1	2	3	3	4

OR

2 (a) Derive an expression for inherent error in the Simpson's $1/3^{rd}$ rule for integration. **5**

(b) State order of inherent error in the 2^{nd} order and the 4^{th} order Runge-Kutta methods for solution of ordinary differential equations. **2**

(c) Solve following simultaneous linear equations using Cramer's rule : **5**

$3x + y + 2z = 3$

$2x - 3y - z = -3$

$x + 2y - z = 4$

3 (a) What are the different ways of coming out of a DO loop in FORTRAN ? **2**

(b) Explain the various control statements in FORTRAN. **3**

(c) What is the use of common statement in FORTRAN. **2**

(d) Write a C-program for the function $f(x)$ defined as below : **5**

$f(x) = 2x^2 + 3x + 4$ for $x < 2$

$= 0$ for $x = 2$

$= -2x^2 + 3x - 4$ for $x > 2$

OR

3 (a) What are the logical operaters in C-language ? **2**

(b) What is the difference between $++x$ and $x++$ in C-language ? **2**

(c) Explain the use of switch construct in C-programs. **3**

(d) Write a FORTRAN program to read all the integer elements of an N×N matrix and decide if the given matrix is symmetric or not. **5**

SECTION-II

4 (a) Define electric quadrupole moment for a nucleus and show that its value is zero for spherical nuclei. **2**

(b) What are Flavor oscillations ? How is it important in the understanding of the solar neutrino puzzle ? **3**

(c) What is meant by hypercharge ? What is Gell-Mann Nishijinia formula ? **2**

(d) What are the selection rules for Fermi and Gammo -Teller transitions in beta decay ? **2**

(e) State CPT theorem. **2**

5 (a) Explain the importance of the spin orbit interaction in single particle shell model. What are its merits and demerits ? **4**

(b) Explain how the liquid drop model of the nuclei helps to understand the nuclear fission **4**

(c) Find all the possible multipole transitions between $J_a = 1^+$ and $J_b = 2^-$ states. **4**

OR

5 (a) Discuss in detail the different exchange forces of the nuclear two-body force. **4**

(b) Explain the selection rules for the E2 and M1 transitions in nuclei. **4**

(c) Find the spin and parity of the ground state of the following nuclei on the basis of the shell model. **4**

(i) ${}_6C^{12}$; (ii) ${}_{13}Al^{27}$

6 (a) What are the most fundamental constituents of matter ? What are their properties ? **4**

(b) Explain with the help of an example the need for the color degree of freedom for quarks. **4**

(c) Give the quark description for **4**

(i) p; (ii) $\wedge$; (iii) π^-; (iv) K°

and explain the conservation of isospin and strangeness in the following reaction :

$\pi^- + p \rightarrow \wedge + K^\circ$.

OR

6 (a) What are Higgs particles ? Why are they so important in the standard model of particle physics ? 4

(b) Give an account of the experimental demonstration of the parity violation in beta decay. Also explain the CP violation observed in the neutral K-meson. 4

(c) What are quark contents of $D^+, K^+, \wedge_8, \sum^-$ hadrons ? 4