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AC-1413

M. Sc. (Sem. II) Examination

April / May - 2015

Physics : PH - 424

(Numerical Analysis & 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. (SEM. II)**

Name of the Subject :

☛ **PHYSICS : PH - 424**

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

Seat No. :

Student's Signature

(2) Attempt all questions.
(3) Symbols used have their usual meaning
(4) Figures to the right indicate marks.
(5) Assume data wherever necessary.
(6) Scientific calculator may be used.

1 Attempt any two questions.

(a) (i) What is the role of interpolation in numerical evaluation of definite integrals? Explain. 3

(ii) Applying the method of least squares find an equation of the form $y=ax+bx^2$ that fits the following data: 4

x	1	2	3	4	5	6
y	2.6	5.4	8.7	12.1	16.0	20.2

(b) (i) Write expressions for Trapezoidal rule, Simpson's 3/8th rule and Weddle rule for numerical integration. 3

(ii) Find all the eigen values and eigen vectors of the matrix given below using Jacobi method 4

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

(c) (i) Derive Trapezoidal rule for integration and also an expression for inherent error in it. 3

(ii) Use the fourth order Runge-Kutta method to numerically solve 4

$$10\frac{dy}{dx} = x^2 + y^2 \; ; \; y(0) = 1$$

and find y at x=0.1 taking h=0.1.

2 Attempt any two questions.

(a) (i) Derive the expression for the remainder term in Lagrange interpolation formula? 3

(ii) Two computations of a definite integral are made using Simpson's $1/3^{rd}$ rule giving R_1 and R_2 as corresponding results. Show that the inherent error in the second computation (E_2) is given by $E_2 = (R_2-R_1)/15$. When the number of subintervals used in the second computation is twice that used in the first. 4

(b) (i) What is meant by an algorithm and a flow-chart? What are the various symbols used in drawing a flow-chart? 3

(ii) Solve following simultaneous linear equations using matrix inverse method: 4

$$3x + y + 2z = 3$$
$$2x - 3y - z = -3$$
$$x + 2y + z = 4$$

(c) (i) Explain the terms (i) application software (ii) machine level language (iii) higher level language. 3

(ii) What are higher level languages? Why are they called so? Discuss the roles of *compiler* and *linker* in case of programming with higher level languages. 4

3 Attempt any two questions.

(a) (i) Explain briefly about various types of variables in FORTRAN. 3

(ii) Define the general syntax of calculated GOTO statement. 2

(iii) Given that int x=2,y=3,z=2,t=4; 2
Evaluate the following expressions:
(a) z-(x+z)
(b) (x+y)/2+z

(b) (i) Distinguish between input and output statement as used in FORTRAN. 2

(ii) Explain the various kinds of Errors with examples. 2

(iii) Write down FORTRAN program which print out the numbers up to 100, which are completely divisible by 3, using DO - ENDDO loop. 3

(c) (i) Elaborate subscripted variables? Provide the rules with example. 3

(ii) What is the difference between PRINT and WRITE statements? 2

(iii) Write FORTRAN program for summations of 1 to 20 numbers. 2

4 **Attempt any two questions.**

(a) (i) Write the guidelines to use *printf()* function in C language. 3

(ii) What is an operator? Explain the arithmetic, relational, logical, and assignment operators in C language. 4

(b) (i) Write a program in C to print the numbers from 4 to 9 and their squares. 3

(ii) Explain the use of *continue* statement in loops with example. 4

(c) (i) Explain the two way selection (if, if-else and nested if-else) in C language with syntax. 3

(ii) Write a C Program to find the roots of a quadratic equation. 4

5 **Attempt any two questions.**

(a) (i) Write the **C** arithmetic expression corresponding to the following mathematical expression: (A) $x^{-1/3}-y^{-2}e^{-z}$ (B) $\frac{a+b}{a-b}$ 2

(ii) Write down FORTRAN program to obtain the sum of the digit of a five digit number. 5

(b) (i) What are executable and non-executable statements in FORTRAN? 2

(ii) Write a recursive function in C to find factorial of a given number. 5

(c) (i) Write a C program to read the input string from a file and displays the number of characters in the file on screen. 2

(ii) Write a FORTRAN or a C program to solve 5

$$dy/dx= (y+x)/(y-x)$$

with given (x_0, y_0) and h and using the second order Runge-Kutta method.