

AC-1413

M. Sc. (Sem. II) Examination

April / May - 2015 Physics: PH - 424

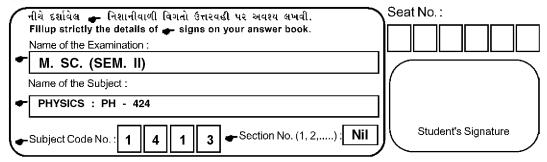
(Numerical Analysis & Computer Programming)

Time: 3 Hours]

[Total Marks: 70

Instructions:

(1)



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

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X	1	2	3	4	5	6
У	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 3 numerical integration.
 - (ii) Find all the eigen values and eigen vectors of the matrix given below using 4 Jacobi method

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

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

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

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

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?
 - (ii) Two computations of a definite integral are made using Simpson's $1/3^{rd}$ rule 4 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.
- (b) (i) What is meant by an algorithm and a flow-chart? What are the various symbols 3 used in drawing a flow-chart?
 - (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 3 level language.
 - (ii) What are higher level languages? Why are they called so? Discuss the roles of 4 compiler and linker in case of programming with higher level languages.

3 Attempt any two questions.

- (a) (i) Explain briefly about various types of variables in FORTRAN.
 - (ii) Define the general syntax of calculated GOTO statement.
 - (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.
 - (iii) Write down FORTRAN program which print out the numbers up to 100, which 3 are completely divisible by 3, using DO ENDDO loop.
- (c) (i) Elaborate subscripted variables? Provide the rules with example.
 - (ii) What is the difference between PRINT and WRITE statements?
 - (iii) Write FORTRAN program for summations of 1 to 20 numbers.

4 Attempt any two questions.

- (a) (i) Write the guidelines to use *printf()* function in C language.
 - (ii) What is an operator? Explain the arithmetic, relational, logical, and assignment 4 operators in C language.

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- (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.
- (c) (i) Explain the two way selection (if, if-else and nested if-else) in C language with 3 syntax.
 - (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 2 expression: (A) $x^{-1/3}$ - $y^{-2}e^{-z}$ (B) $\frac{a+b}{a-b}$
 - (ii) Write down FORTRAN program to obtain the sum of the digit of a five digit 5 number.
- (b) (i) What are executable and non-executable statements in FORTRAN?
 - (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 2 characters in the file on screen.
 - (ii) Write a FORTRAN or a C program to solve $\frac{dy/dx = (y+x)/(y-x)}{\text{with given } (x_0, y_0) \text{ and h and using the second order Runge-Kutta method.}$