(b) Write the starting and stopping criteria of iterative methods used to solve the algebraic equations. **6**

(c) Use the least-square curve fitting to find the best straight line which fits the following points : **10**

x	= 1	2	3	4	5	6
y	= 2	5	10	17	26	37

Unit III

5. (a) A rod is rotating in a plane. The following table gives the angle y in radians through which the rod has turned for various values of time x in second. Calculate the angular velocity of the rod at time 0.4. Use the Stirlling's formula and choose the origin at 0.4 second : **10**

x	$f(x)$
0	0
0.2	15
0.4	20
0.6	30
0.8	35

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AA-283

M. Sc. EXAMINATION, May 2018

(First Semester)

(Re-appear Only)

PHY505B

PHYSICS

Computational Physics

Time : 3 *Hours*] [*Maximum Marks :* 100

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks. Students may be allowed to use simple calculator.

Unit I

1. (a) Draw the sketch of computer organization and outline the role of its essential units. **10**

   (b) Write a general syntax to read one and two dimensional array. **4**

   (c) Write a general syntax for logical, arithmetic and nested if statements with suitable examples. **6**

2. (a) When and how Do loop is used in Fortran programming. Also write the different rules for using Do loop and explain them with suitable examples. **10**

   (b) Find the value of the following expession for A = 7.0, B = 9.0, I = 8 and J = 3 (2*A**3+I/7+56)*J**2. **2**

   (c) Write the following expression in Fortran : **2**

$$\frac{a+b}{2c^2} - b(d-e)(a \times d)^2 \text{ and}$$

$$z = \sin\left|\frac{a-b}{a+b}\right| - \sqrt{5p^3 - r^{2x}}.$$

   (d) Discuss in details the data types used in Fortran with examples.

Unit II

3. (a) Write a note with examples on machine and random errors. **4**

   (b) Construct the backward difference table from the following set of values : **6**

x	$f(x)$
0	15
1	25
2	35
3	45
4	55
5	65

   (c) Give the graphical illustration of Bisection method and find the root of the equation $f(x) = x^2 - 4x - 10 = 0$ using Bisection method. **10**

4. (a) Find the truncation error in computing the following function :

$$e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!}$$

   While $x = 1/5$ and you use first three terms. **4**

(b) Find the value of $y(1.4)$ through the differential equation $\frac{d^2y}{dx^2} = x\frac{dy}{dx} + y$ by fourth order Runge-Kutta method. While $y(1) = 1$ and $\frac{dy}{dx}$ at 1 is 2. **10**

8. (a) Estimate the value of y at 0.4 using Fourth-Order Runge-Kutta Method, when $\frac{dy}{dx} = x^2 + y^2$ with $y(0) = 0$. Here use interval size (h) = 0.2. **10**

(b) Calculate the value of y at $x = 2$ by Euler's method using interval size = 0.5, while $\frac{dy}{dx} = x + y$ with $y(1) = 2$. **10**

(b) Find the f' at $x = 1.7$ and 2.8 by using the following data : **10**

x	f
1.0	22
1.5	102
2.0	322
2.5	722
3.0	822

6. (a) Compute the integral $\int_{-2}^{2} e^{x/5} dx$ using Gaussian two point formula. **10**

(b) Evaluate $\int_0^2 \int_0^1 \left(x^2 + y^2\right) dx\, dy$ using Trapezoidal rule. Use step size equal to 0.5. **10**

Unit IV

7. (a) Using Taylor method solve the given differential equation for the interval (0, 0.2), when $y(0) = 0$, $\frac{dy}{dx} = x^2 - y^2$. Here use interval size (h) = 0.1. **10**