MANIPAL ACADEMY of HIGHER EDUCATION
(Deemed to be University under Section 3 of the UGC Act, 1956)

Reg. No.										

DEPARTMENT OF SCIENCES,
II SEMESTER M.Sc (PHYSICS) - END SEM. EXAMINATIONS, APRIL 2018

Subject : PHY 4204 - NUMERICAL METHODS AND COMPUTATIONAL PHYSICS
(REVISED CREDIT SYSTEM-2017)

Time: 3 Hours MAX. MARKS: 50

Note: (i) Answer **ALL** questions
(ii) Draw diagrams, and write equations wherever necessary

1 (a) Write a C program to obtain least square linear fit for the data entered by the user **4 M**

1 (b) Obtain a real root for the equation $\boldsymbol{xe^x = 1}$ using ***false-position*** method with an accuracy of 3 decimal places **3 M**

1 (c) Write a C program to implement the following series **3 M**

$$\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \cdots$$

2 (a) Solve the following system of equations by ***Gauss Jordan*** method **5 M**
$x + (y/2) + (z/2) = 5,\quad 3(x+z) + 2y = 18,\quad x + 4y + 9z = 16$

2 (b) Find f(0.3) from the following data using Newton's ***divided difference method:*** **3 M**
(0, 1), (1, 3), (3, 49), (4, 129), (7, 813)

2(c) Find $\int_0^1 ydx$ from the following data using ***Simpson's 1/3 rule:*** (0, 1), (0.25, 0.8), (0.5, 0.6667), (0.75, 0.5714), (1, 0.5) **2 M**

3 (a) If $y' = x - y^2$ and $y(0) = 1$ find y(0.1) by ***Taylor series method*** **4 M**

3 (b) If $\partial^2 u/\partial t^2 = 4\ \partial^2 u/\partial x^2$ then find u(2, 1.5). **3 M**
Given $u(0,t) = u(4,t) = 0,\ u(x,0) = (4x - x^2)$ & $u(x, 0.5) = u(x, -0.5)$

3 (c) Write a C program to simulate the radioactive decay process by Monte Carlo method **3 M**

4 (a) If $\partial^2 u/\partial x^2 + \partial^2 u/\partial y^2 = -10(x^2 + y^2 + 10)$ find u(1,1) u(1,2), u(2,1) and u(2,2). Given: $u(0,y) = u(x,0) = u(x,3) = u(y,3) = 0$ **5 M**

4 (b) Write a C program to find $\int_0^3 x^2 dx$ by Monte Carlo crude integration method **3 M**

4 (c) If $dy/dx = (y - x)$ and y(0)=2 then find y(0.2) by II order Runge Kutta method **2 M**

5 (a) Solve the equation $y'' = y$ with the boundary conditions y(0)=0, y(2)=3.62686 and step size h=0.5 **5 M**

5(b) Write a C program to solve a system of 3 linear equations by Gauss Jordan method **5 M**

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