Dr. GRK

Reg.No										

MANIPAL UNIVERSITY, MANIPAL

SECOND SEMESTER M.Sc. (Physics)
END SEMESTER EXAMINATION-2016
Numerical Methods and Computational Physics (PHY – 604)
(CREDIT SYSTEM)

Time: 3 Hrs. **Max. Marks: 50**

NOTE: (a) Answer any FIVE full questions. (b) All questions carry equal marks.

1. **(a)** Write a C program to multiply two 4X4 matrices.
   (b) Obtain Lagrange's interpolation formula from the properties of divided differences.

2. **(a)** Obtain Simpsons's 1/3rd integration rule from Newton's forward difference formula
   (b) Write a C program to obtain linear least square fit for a given set of data

3. **(a)** Fit a 3rd degree polynomial to the following data: (1, -5), (2, -5), (3, 9), (4, 43), (5, 103).
   (b) Solve the following system of equations by Gauss-Jordan method:

$$10k - 2l - m - n = 3$$
$$-2k + 10l - m - n = 15$$
$$-k - l + 10m - 2n = 27$$
$$-k - l - 2m + 10n = -9$$

4. **(a)** Using Trapezoidal rule, evaluate $\int_0^1 \sqrt{1-x^2}\,dx$ with step-size h=0.1.
   (b) Given that $y' = x - y^2$ and $y(0) = 1$. Using Taylor series for y(x), find y(0.1) correct to 4 decimal places.

5. **(a)** Solve the equation $\partial^2 u/\partial t^2 = \partial^2 u/\partial x^2$ (from time interval k=1 to k=3) with the conditions $u(0,\ t) = u(1,\ t) = 0,\ \ u(x,0) = sin^3(\pi x),\ 0 \le x \le 1$ and $u(i,-1) = u(i,1)$
   (b) Write a C program to simulate the radioactive decay process by Monte-Carlo technique. The results of the simulation must be stored in the file *D:\simulation.dat*.

6. **(a)** Write a C program to generate forward difference table for the given set of data
   (b) Write a C program to find $sin^{-1}(x)$ using following series. The number of terms in the series and the value of x are to be input by the user.
   $sin^{-1}(x) = x + (1/2)(x^3/3) + (1/2)(3/4)(x^5/5) + \ldots$

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