Dr. GRK

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MANIPAL UNIVERSITY, MANIPAL

SECOND SEMESTER M.Sc. (Physics)
END SEMESTER EXAMINATION (Makeup)-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.

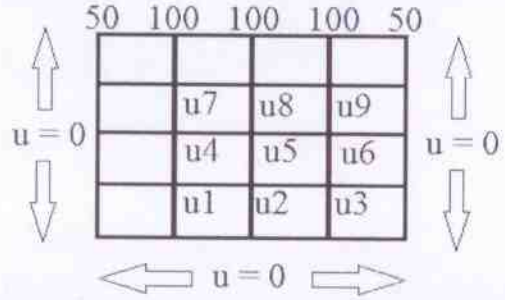
1. **(a)** Monthly (30 days) temperature data of three cities are stored in three separate files: city1.dat, city2.dat and city3.dat. Write a C program to read temperature data from these files; find maximum, minimum, average and standard deviation of temperatures and append the results in corresponding files.
   (b) Write a C program to implement Lagrange's interpolation formula on a given set of data entered by the user

2. **(a)** From successive approximation method, inverse interpolate the set of data given below to find x(10) accurate upto 4 decimal points. Given: (2, 6), (3, 25), (4, 62), (5, 123)
   (b) Write a C program to obtain solution of a system of four linear simultaneous equations by Gauss Jordan method.

3. **(a)** Construct a least square quadratic approximation to the function $y(x) = sin(x)$ in the interval $[0, \pi/2]$ with respect to weight function $W(x) = 1$
   (b) Write a C program to find the transpose and trace of a 3X3 matrix entered by the user.

4. **(a)** Using Simpson's 1/3 rule, evaluate $V = \int_0^1 \pi y^2 dx$ for the following set of data: (0, 1), (0.25, 0.9896), (0.5 0.9589), (0.75, 0.9089), (1, 0.8415)
   (b) Obtain finite difference approximations for $y'(x)$ *and* $y''(x)$ from Taylor series. Solve the boundary value problem $y'' - y = 0$ with boundary conditions $y(0) = 0$ and $y(2) = 3.62686$ (Take a step-size of 0.5)

5. **(a)** Solve the equation $\partial^2 u/\partial x^2 = -\partial^2 u/\partial y^2$ for the data given below



   (b) Explain Monte-Carlo crude integration technique. Write a C program to implement it.

6. **(a)** Write a recursive C program to find GCD and LCM of two numbers entered by the user.
   (b) Write a C program to implement II order Runge-Kutta method to solve a differential equation (Differential equation may be suitably assumed)

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