JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Tech I - Semester Examinations, March/April 2011
COMPUTATIONAL METHODS IN ENGINEERING
(MACHINE DESIGN)

Time: 3hours   Max. Marks: 60

Answer any five questions
All questions carry equal marks
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1.   Solve thee following equations by relaxation method
     $10x – 2y – 2z = 6$, $-x – 10y – 2z = 7$, $-x – y + 10z = 8$.   [12]

2.   a) Derive Gaussian quadrature formula.

     b) Evaluate $\int_{0}^{1} \frac{dx}{1+x^2}$ by
        i) Trapezoidal rule
        ii) Simpson's 1/3 rd rule, taking $h = .25$

                                                                          [12]

3.   Solve the boundary value problem $y'' + y = -x$, $0 < x < 1$
          $Y(0) = y(1) = 0$, by Rayleigh ridge method   [12]

4.   Solve $\frac{d^2 y}{dx^2}$ - $\frac{dy}{dx}$ - $y^2 = 0$, $0 \le x \le 1$

          $\frac{dy}{dx} = (y – 1)$ at $x = 0$

                  $= 0$ at $x = 1$ by shooting method   [12]

5.   Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial x^2} = 0$ in $0 \le x \le 4, 0 \le y \le 4$

     Given that $u(0, y) = 0$, $u(4, y) = 8 + 2y$, $u(x, 0) = \frac{x^2}{2}$, $u(x, 4) = x^2$
     And $h = k = 1$ [12]

6.   Solve $\frac{\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial t}$, $0 < x < 1 \ t > 0$
     $u(0, t) = 0$, $u(1, t) = 0$, $u(x, 0) = 100(x - x^2)$ and $h = 0.25$ by Crank Nickelson
     method.   [12]

7.   By the method of least squares fit the parabola $y = a + bx + cx^2$.

x	2	4	6	8	10
y	3.07	12.85	31.47	57.38	91.29

                                                                          [12]

8.   Find the least squares Regression equation of x on y and z from the
      following data   [12]

x	3	5	6	8	12	14
y	16	10	7	4	3	2
z	90	72	54	42	30	12

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