

Code No: C1504

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 the 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  $\frac{d^2y}{dx^2} - \frac{dy}{dx} - y^2 = 0$ ,  $0 \leq x \leq 1$   
 $\frac{dy}{dx} = (y - 1)$  at  $x = 0$   
 $= 0$  at  $x = 1$  by shooting method [12]
5. Solve  $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$  in  $0 \leq x \leq 4$ ,  $0 \leq y \leq 4$   
 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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