Model Question Paper
SIXTH SEMESTER BTECH DEGREE EXAMINATION
(2013 Scheme)
Branch: AERONAUTICAL ENGINEERING

13.602 Computational Methods in Engineering(S)

Time: 3 Hours **Max Marks: 100**

Part-A
Answer all question. Each question carries 2marks.

1. Find the root of the following equation using Newton-Raphson Method.
   $- 5x$ +3.
2. Find the dominant eigen value and eigen vector of : $\begin{bmatrix} 3 & -5 \\ -2 & 4 \end{bmatrix}$.
3. Find the inverse of the matrix : $\begin{bmatrix} -1 & 3 \\ 1 & 6 \end{bmatrix}$ using Guass- Jordan Method.
4. Evaluate $(x+1)(x+2)(x+3)]$.
5. Evaluate $\frac{dx}{.+x^2}$ taking h=0.2 using Trapezoidal rule. Can we use Simpson's rule? Give reason.
6. Write the formula for third order and fourth order Runge-Kutta Method.
7. Write the formula for Adam- Bash fourth predictor corrector formula.
8. Explain weighted residual for initial value problems.
9. Define the classification of partial differential equations of second order.
10. How to use Crank-Nicolson formula?.

Part-B
Answer one question from each module. Each question carries 20 marks

Module -I

11. a) Solve the system of equation using Jacobi's iteration Method.
    $30x_1 - 2x_2 + 3x_3 = 75; x_1 + 17x_2 - 2x_3 = 48; x_1 + x_2 + 9x_3 = 15.$

    b) Solve the system of equation using Gauss-Elimination Method.
    $3x + 4y + 5z = 18; 2x - y + 8z = 13; 5x - 2y + 7z = 20$

12. a) Using Guass –Jordan method , solve the system of equation
    $$5x_1 + x_2 + x_3 + x_4 = 4; x_1 + 7x_2 + x_3 + x_4 = 12; x_1 + x_2 + 6x_3 + x_4 = -5; \quad x_1 + x_2 + x_3 + 4x_4 = -6$$

    b) Find numerically the largest eigenvalue of : $\begin{bmatrix} 1 & -3 & 2 \\ 4 & 4 & -1 \\ 6 & 3 & 5 \end{bmatrix}$ by power method.

Module-II

13. a) Using Newton's Interpolation formula find y at x=8 from the table.

x	0	5	10	15	20	25
y	7	11	14	18	24	32

b) Using Lagrangian formula of interpolation find) from the following table.

x	1	2	3	4	7
y	2	4	8	16	128

14. a)Fit the following four points by the cubic splines

i	0	1	2	3
x_i	1	2	3	4
y_i	1	5	11	8

Use the end conditions= $y_3'' = 0.$ Hence compute $'(1.5)$ and $y'(2)$.

b) Evaluate the integral $\int_1^2 \int_1^2 \frac{dx}{x+y}$ using trapezoidal rule with $k = 0.5$ and $k = 0.25$.

Module-III

15. a) Given = $3x + \frac{y}{2}$ and $) = 1.$ Find the values of $.1)$ and $.2)$ using Taylor series method

b) By applying fourth order Runge-Kutta method find $.2)$ from = $y - x, y(0) = 2$ taking 0.1.

16. a) Using Adam's predictor –corrector method find $.4)$ if satisfies = $\frac{1-xy}{x^2}$ and $) = 1; y(1.1) = 0.996; y(1.2) = 0.986; y(1.3) = 0.972.$

Module-IV

b) Using improved Euler's method find at 0.1 and 0.2 given = $y - \frac{2x}{y}, y(0) = 1$.

Module-IV

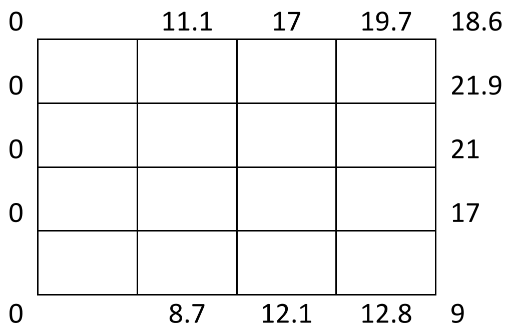
17. a)Solve the differential equation $- y = x$ with $) = 0, y(1) = 0$ with $\frac{1}{4}$ .using finite difference method.

b) Solve $+ u_{yy} = 0$ in $x \leq 4, 0 \leq y \leq 4.$ Given $, y) = 0, u(4, y) = 8 + 2y, u(x, 0) = \frac{x^2}{2}$ and $, 4) = x^2$ taking $k = 1.$ obtain the result correct to three decimal.

18. a)Solve = $\frac{\partial^2 u}{\partial x^2}$ subject to the conditions $, 0) = 0, u(0, t) = 0$ and $, t) = t.$

Compute for $\frac{1}{8}$ in two steps, using Crank-Nicolson formula.

b) Solve Laplace's equation $= 0$ at the interior points of the square region given in the figure.



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