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Total No. of Pages : 02

Total No. of Questions : 09

B.Tech.(CE) (2011 Onwards) (Sem.-6)
NUMERICAL METHODS IN CIVIL ENGINEERING
Subject Code : BTCE-604
Paper ID : [A2291]

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A** is **COMPULSORY** consisting of **TEN** questions carrying **TWO** marks each.
2. **SECTION-B** contains **FIVE** questions carrying **FIVE** marks each and students have to attempt any **FOUR** questions.
3. **SECTION-C** contains **THREE** questions carrying **TEN** marks each and students have to attempt any **TWO** questions.

SECTION-A

1. Write briefly :

- (a) Define algebraic & transcendental equations.
- (b) Write difference between Gauss-Seidal and Gauss-Jacobi's method for simultaneous linear equations. <http://www.punjabpapers.com>
- (c) Write formula of Modified Euler's method for ordinary differential equation.
- (d) Define initial value problem and boundary value problem.
- (e) Write classification of linear partial differential equation :

$$A \frac{\partial^2 u}{\partial x^2} + B \frac{\partial^2 u}{\partial x \partial y} + C \frac{\partial^2 u}{\partial y^2} + D \frac{\partial u}{\partial x} + E \frac{\partial u}{\partial y} + Fu = G.$$

- (f) Write two lines of regression by the principle of least square.
- (g) Write the condition when New mark's method is unconditionally stable.
- (h) Define Stability of Explicit method.
- (i) Define Karl Pearson's coefficient of correlation.
- (j) Write hyperbolic partial differential equation.

SECTION-B

2. Solve the following system of equations using Gauss Elimination method with partial pivoting

$$x + y + z = 7$$

$$3x + 3y + 4z = 24$$

$$2x + y + 3z = 16$$

3. Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 8x^2 y^2$ for the square mesh given $u=0$ on the four boundaries dividing the square into 16 sub-squares of length one unit.

4. Use Galerkin's method of least square to find the approximate solution of the following

boundary value problem. $x \frac{d^2 y}{dx^2} + \frac{dy}{dx} + y = x; y(0) = 0; y(1) = 1.$

5. Calculate the coefficient of correlation and obtain the least square regression lines for the following data : <http://www.punjabpapers.com>

x	1	2	3	4	5	6	7	8	9
y	9	8	10	12	11	13	14	16	15

Also obtain an estimate of y which should correspond on the average to $x=6.2$.

6. Explain Newmark's algorithm for a SDOF system.

SECTION-C

7. Apply the power method to find the dominant Eigen value of the matrix

$$\begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}.$$

8. Determine values of y at the pivotal points of the interval $(0, 1)$ if y satisfies the boundary value problem $y^{(n)} + 81y = 81x^2, y(0) = y(1) = y''(0) = y''(1) = 0$ take $(n = 3)$.

9. Solve the problem $\frac{dy}{dx} = -2y + x; y(0) = 1$ for $y(0.1), y(0.2)$ by using

(a) Runge-Kutta method of third order

(b) Runge-Kutta method of fourth order