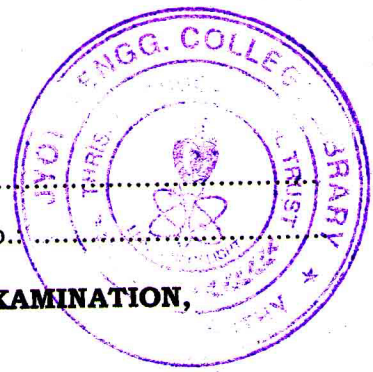


23459

Name:

Reg. No.



**FIFTH SEMESTER B.TECH (ENGINEERING) DEGREE EXAMINATION,
DECEMBER 2012**

ME/AM 04 501 – COMPUTATIONAL METHODS IN ENGINEERING

Time : 3 Hours

Maximum : 100 Marks

(Answer all questions)

Part A

- I (a) Set up a Newton iteration for computing the root of a given positive member N and hence find $\sqrt{2}$ correct to 3 decimal places.
- (b) If $g(x)$ is continuous $[a,b]$ then under what condition the iterative method $x = g(x)$ has a unique solution in $[a,b]$? Mention the importance of Graeffe's root squaring method.
- (c) Apply Gauss-Jordan method to solve the equations $3x + 4y = 8$ and $4x + 3y = 7$.
- (d) State the principle of relaxation method for solving a system of linear algebraic equations. What are the constraints of Crout's reduction method.
- (e) Deduce Simpson's $\frac{1}{3}$ rd rule and $\frac{3}{8}$ th rule from Newton-Cote's quadrature formula.
- (f) Use Newton's divided difference formula to find $f(x)$ from the following data.
- | | | | | | |
|--------|---|---|----|----|-----|
| x | : | 0 | 1 | 4 | 5 |
| $f(x)$ | : | 8 | 11 | 78 | 123 |
- (g) Compare the Taylor's series and Runge-Kutta method. Give two disadvantages of Taylor's Series method.
- (h) Using modified Euler's method solve $\frac{dy}{dx} = x^2 + y$, $y(0) = 1$ to find $y(0.2)$ and $y(0.4)$.

(8 x 5 = 40 Marks)

PART - B

- II (a) (i) Find a real root of the equation $x \log_{10} x = 1.2$ by Regula-Falsi method correct to 3 decimal places.
- (ii) Apply Graeffe's root squaring method to solve the equation $x^3 - 8x^2 + 17x - 10 = 0$.
- (Or)
- (b) (i) Find the real positive root of $3x - \cos x - 1 = 0$ by Newton's method corrected to a decimal places.
- (ii) Find the root of the equation $x = e^{-x}$ near $x = 0.5$ correct to 4 places of decimals, using Chebyshev's method.

Turnover

III (a) (i) Solve by Gauss-Seidel method $8x - 3y + 2z = 20, 4x + 11y - z = 33, \dots$
 $6x + 3y + 12z = 35.$

(ii) Find the numerically largest eigen value of $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$ by the power method.

(Or)

(b) (i) Solve the following system of equations by Crout's method:

$$3x + 2y + 7z = 4, 2x + 3y + z = 5, 3x + 4y + z = 7$$

(ii) Solve the Jacobi's iteration method, the equations

$$20x + y - 2z = 17; 3x + 20y - z = -18; 2x - 3y + 20z = 25.$$

IV (a) (i) Find a polynomial $f(x)$ with the following data using Newton's divided difference formula.

x	:	-4	-1	0	2	5
$f(x)$:	1245	33	5	9	1335

(ii) From the following table estimate the number of students who obtained marks between 40 and 45:

Marks	30-40	40-50	50-60	60-70	70-80
No. of students	31	42	51	35	31

(Or)

(b) (i) Use Simpson's $\frac{1}{3}$ rd rule to find $\int_0^{0.6} e^{-x^2} dx$ by using seven ordinates.

(ii) Use Stirling's formula to evaluate $f(1.22)$ given

x	:	1.0	1.1	1.2	1.3	1.4
$f(x)$:	0.841	0.891	0.932	0.963	0.985

V (a) (i) Use Runge-Kutta method of 4th order to find the value of y when $x = 1$, given that $y = 1$ when $x = 0$ and that $\frac{dy}{dx} = \frac{y-x}{y+x}$.

(ii) Using Adams-Bashforth method, obtain the solution of $\frac{dy}{dx} = x - y^2$ at $x = 0.8$,

given the values

x	:	0	0.2	0.4	0.6
y	:	0	0.0200	0.0795	0.1762

(Or)

(b) (i) Apply Milnes Predictor corrector method find $y(0.4)$ given $\frac{dy}{dx} = 1 + xy^2, y(0) = 1$
 $y(0.1) = 1.105, y(0.2) = 1.223$ and $y(0.3) = 1.355$.

(ii) Solve the boundary value problem $u_{tt} = u_{xx}$ with the conditions $u(0, t) = u(1, t) = 0$

$$u(x, 0) = \frac{1}{2}x(1-x) \text{ and } u_t(x, 0) = 0, \text{ taking } h = 0.1 \text{ for } 0 \leq t \leq 0.4.$$

(4 x 15 = 60 Marks)
