



B.E DEGREE EXAMINATIONS: MAY 2015

(Regulation 2009)

Fifth Semester

MAT108: NUMERICAL METHODS

(Common to ECE/IT)

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

- The first approximation to the root lying between 0 and 1 of $x^2 + 3x - 1 = 0$ by Newton's method is
 - 0.4523
 - 0.5623
 - 0.3333
 - 0.3753
- The order of Convergence of fixed point iteration $x = g(x)$ method is
 - 1
 - 2
 - 3
 - 4
- The second order divided differences for the data
 - 1
 - 2
 - 3
 - 4
- The Lagrange's formula to find $y(x)$ if 2 sets of values (x_0, y_0) and (x_1, y_1) are given is
 - $Y(x) = \frac{(x-x_2)}{(x_0-x_2)} y_0 + \frac{(x-x_0)}{(x_2-x_0)} y_1$
 - $Y(x) = \frac{(x-x_2)}{(x_0-x_2)} y_1 + \frac{(x-x_0)}{(x_2-x_0)} y_0$
 - $Y(x) = \frac{(x-x_0)}{(x_0-x_2)} y_0 + \frac{(x-x_2)}{(x_2-x_0)} y_1$
 - $Y(x) = \frac{(x-x_2)}{(x_0-x_2)} y_0 + \frac{(x-x_0)}{(x_2-x_0)} y_1$
- Find $\frac{dy}{dx}$ at $x=2$ from the following data
 - 59
 - 110
 - 21
 - 57

20.

Express the simplest form of crank – Nicholson’s scheme to solve $\frac{\partial u}{\partial t} = C \frac{\partial^2 u}{\partial x^2}$.

PART C (5 x 14 = 70 Marks)

21. a) (i) Use Newton-Raphson method to solve the equation $3x - \cos x - 1 = 0$. (7)
 (ii) Solve the following equations (7)

$83x + 11y - 4z = 95; 7x + 52y + 13z = 104; 3x + 8y + 29z = 71$ by Gauss – Seidel Method.

(OR)

- b) (i) Find the real root of $x^3 - 2x^2 - 4 = 0$ correct to three decimal places by iteration method. (7)
 (ii) Find the inverse of $A = \begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}$ by Gauss-Jordan method. (7)

22. a) (i) From the following table, estimate $e^{0.644}$ correct to five decimals using Stirling’s formula. (7)

$x:$	0.61	0.62	0.63	0.64	0.65	0.66	0.67
$e^x:$	1.840431	1.858928	1.877610	1.896481	1.915541	1.934792	1.9542237

- (ii) Apply Lagrange’s formula to find $f(5)$, given that $f(1) = 2, f(2) = 4, f(3) = 8$ and $f(7) = 128$. (7)

(OR)

- b) (i) Using Newton’s Forward interpolation formula, find the value of $\sin 52^\circ$ given that $\sin 45^\circ = 0.7071, \sin 50^\circ = 0.7660, \sin 55^\circ = 0.8192, \text{ and } \sin 60^\circ = 0.8660$. (7)
 (ii) From the data given below, find the value of x when y = 100 (7)

x	:	3	5	7	9	11
y	:	6	24	58	108	174

23. a) (i) Find $f'(x)$ at $x = 2.9$ from the following data (7)

$x:$	1	1.5	2	2.5	3
$y:$	27	106.75	324	783.75	1621

- (ii) Evaluate $\int_0^\pi \sin x \, dx$ by dividing the interval into 8 strips using Trapezoidal rule (7)

(OR)

b) (i) Find the value of $\log_e 2$ from $\int_0^1 \frac{x^2}{1+x^3} dx$ using Simpson's 1/3 rule, by dividing the range into 6 equal parts (7)

(ii) Using Trapezoidal rule, evaluate $I = \int_1^2 \int_1^2 \frac{dx dy}{x+y}$, taking four sub intervals. (7)

24. a) (i) Using Taylor series method find y at x = 0.1 if $\frac{dy}{dx} = x^2 y - 1$, y(0) = 1. (7)

(ii) Using Milne's method, compute y (0.8) given that (7)

$$\frac{dy}{dx} = 1 + y^2, y(0) = 1, y(0.2) = 0.2027, y(0.4) = 0.4228 \text{ and } y(0.6) = 0.6841.$$

(OR)

b) (i) Using improved Euler method find y at x = 0.1 given $\frac{dy}{dx} = y - \frac{2x}{y}$, y(0) = 1 (7)

(ii) Find y(0.1) using fourth order R – K method, given $\frac{dy}{dx} = \frac{y-x}{y+x}$, y(0) = 1. (7)

25. a) Solve by Crank – Nicholson's implicit method, $16u_t = u_{xx}$, $0 < x < 1$, $t > 0$ with $u(x,0)=0, u(0,t)=0, u(1,t)=100t$. Compute u for one time step with $h=0.25$.

(OR)

b) Solve $u_{xx} + u_{yy} = 0$ for the following square mesh with boundary values as shown in the following figure.


