Fayoum University **Faculty of Engineering**	**Civil Engineering** **Model answer of the final exam**	**Second year** ***Numerical Analysi*** **21-1-2010*s***

Maximum mark=70

1-Use two different interpolation formulas to find y when x=2.2 by using the readings (1,10),(2,100),(3,1000),and (4,1000).
(17M)

1-Form the divided difference table

2-Use Gauss forward –Gauss backword –Sttirling -general Newton- Lagrage method only

2-Given the following readings (1,10),(2,100),(3,1000),and (4,1000) and using a least squares technique, Find A and B such that $y = \mathrm{AB}^{\mathrm{x}}$ presents an approximation for the given (x,y). Calculate the root mean squares error.
(20M)

$$y = \mathrm{AB}^{\mathrm{x}}$$

logy=logA+xlogB

Y=a+bx

Form a table to get $\sum Y, \sum x, \sum xY, \sum x^2$

Solve the equations and compute a,b a=.5,b=.7

A= $10^{.5}$ *, B=* $10^{.7}$

RMSEs= $\sqrt{\dfrac{\sum (F(x) - f(x))^2}{N}}$

3-Use Runge-Kutta method of fourth order to find y when x=1.2 if

$x\frac{d^2y}{dx^2}+\frac{dy}{dx}+xy=0$ y(1)=0.765 , $\frac{dy}{dx}(1)=-0.440$

(18M)

$let\ \ z=\frac{dy}{dx}$

$\frac{dz}{dx}=\frac{\text{- z - xy}}{\text{x}}$ *x= , y=0.765, z=-0.44*

Use Runge-Kutta method of fourth order twice on the above equations simultaneously.

$$4\text{ - If }A=\begin{pmatrix}1 & 2 & 4\\ 0 & 5 & 3\\ 0 & 3 & 5\end{pmatrix}$$

a-Is matrix A diagonalizable? Why?

(7M)

compute the eignvalues

they are distinct so the matrix is diagonalizable

b-Find A^3 +2A and its eigenvalues.

(5M)

Get A^3 *+2A using Cayley Hamilton theorem or diagonalization*

Eigenvalues= $\lambda_i^3+2\lambda_i \qquad i=1,2,3$

c-Find A^3-11A^2-24A-16I

(3M)

$$A^3-11A^2-24A-16I \;=-50A= \begin{pmatrix} -50 & -100 & -200 \\ 0 & -250 & -150 \\ 0 & -150 & -250 \end{pmatrix}$$