KERALA AGRICULTURAL UNIVERSITY

B.Tech (Food.Engg) 2012 Admission

IV[th] Semester Final Examination- July -2014

Cat. No: Basc.2209 **Marks: 80**

Title: Numerical Methods for Engineering Applications (1+1) **Time: 3 hours**

Part-A

Answer *all* questions (10 x 0.5 =5)

1) If α, β, γ are the roots of $x^3 = 7$, then $\sum \alpha =$ ....
2) If a is a repeated root of the polynomial equation $f(x) = 0$, then $f(a) =$ ...., $f'(a) =$ ....
3) The order of convergence of Newton-Raphson method
   a. 2
   b. 1
   c. 0
   d. none
4) If c_1 and c_2 are two real and distinct roots of an auxiliary equation, then the complimentary function is................
5) While solving the equation $AX = B$, by Gauss elimination method A is transformed into .... matrix
   a. An upper triangular
   b. A lower triangular
   c. A diagonal
   d. A unit matrix
6) The $(n+1)^{th}$ difference of a n^{th} degree polynomial is..........
7) $E^n f(x) =$ ....
8) By Euler's method , $y_n =$ ....
9) How many positive roots are there for the equation $x^3 + x^2 + x - 100 = 0$.
10) Newton's divided difference formula is applicable for .... spaced points

Part-B

Answer *all* questions (5x1= 5)

1) State Newton-Raphson formula
2) Define the operators : Δ and ∇
3) By trapezoidal rule, $\int_a^b f(x)dx =$ ....
4) Solve $y_{n+2} - 4y_{n+1} + 4y_n = 0$

5) The system of equations $x+2y+z=9, 2x+y+3z=7$ can be expressed as

a. $\begin{bmatrix} 1 & 2 & 1 \\ 2 & 1 & 3 \end{bmatrix} = \begin{bmatrix} 9 \\ 7 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix}$

b. $\begin{bmatrix} 1 & 2 & 1 \\ 2 & 1 & 3 \end{bmatrix} \begin{bmatrix} 9 \\ 7 \end{bmatrix} = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$

c. $\begin{bmatrix} 1 & 2 & 1 \\ 2 & 1 & 3 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 9 \\ 7 \end{bmatrix}$

d. None of these

Part-C

Answer *any 10 questions* (10x3=30)

1) Using bisection method find a real root of $x^3-9x+1=0$

2) Using Newton –Raphson method $x^3-4x+1=0$

3) Find the condition that the roots of the equation $x^3+px^2+qx+r=0$ may be in a G.P.

4) Prove that the 3^{rd} divided difference with arguments a, b, c, d of the function $\frac{1}{x}$ is $\frac{-1}{abcd}$

5) Prove that $\Delta^3 y_0 = y_3 - 3y_2 + 3y_1 - y_0$

6) Evaluate $\int_1^2 \frac{dx}{1+x^2}$ taking $h=0.2$ using the trapezoidal rule. Can you use Simpson's rule? Why?

7) Obtain the interpolation polynomial for the given data by using Newton's forward formula

x:	0	2	4	6
y:	−3	5	21	45

8) Solve the difference equation $y_{n+3} - 2y_{n+2} - 5y_{n+1} + 6y_n = 0$

9) Using Taylor series method, find y at $x=0.1$, given $\frac{dy}{dx} = 2y + 3e^x$, $y(0)=0$

10) Using Euler method ,find $y(0.2)$ for the equation $\frac{dy}{dx} = y - x^2 + 1; y(0) = 5$

11) Classify the equation $\frac{\partial^2 f}{\partial x^2} + \frac{2\partial^2 f}{\partial x \partial y} + \frac{4\partial^2 f}{\partial y^2} = 0.$

12) Using Gauss elimination method ,solve

a. $x+4y-z=-5, x+y-6z=-12, 3x-y-z=4$

Part-D

Answer *any 6 questions* (5x6=30)

1) Solve using Crout's method: $3x+2y+7z=4, 2x+3y+z=5, 3x+4y+z=7$.

2) Using Gauss-Jordan method, solve the system of equations:

$$3x-y+2z=12, x+2y+3z=11, 2x-2y-z=2.$$

3) The population of a town is given below. Estimate the population in the year 1895 and 1925.

$year(x)$:	1891	1901	1911	1921	1931
$population(y)$:	46	66	81	93	101

4) By Newton's formula, find y as a polynomial in x from the following observations. Also find y(5).

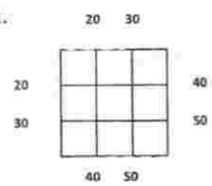
x:	0	2	3	4	7	9
y:	4	26	58	112	466	922

5) Evaluate $\int_0^5 \frac{dx}{4x+5}$ using Trapezoidal and Simpson's rule.

6) Using Taylor series method, find the value of $y(0.1)$ and $y(0.2)$, given $\frac{dy}{dx}=x^2+y^2; y(0.)=1$.

7) Prove the results $(i) E=e^{hD}, (ii) \mu\delta=\frac{\Delta E^{-1}}{2}+\frac{\Delta}{2}$

8) Solve the elliptic equation $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0$, at pivotal points of the following square mesh.



Part-E

Answer *any one question* (1x10=10)

1) Apply Runge-Kutta method of 4^{th} order to find the value of $y(0.1)$ and $y(0.2)$, if $y'=x+y^2; y(0)=1$.

2) Using Crank-Nicholson method, solve $\frac{\partial u}{\partial t}=\frac{\partial^2 u}{\partial x^2}$ and $u(x,0)=0, u(0,t)=0$ and $u(1,t)=t$, for two time steps.