KERALA AGRICULTURAL UNIVERSITY

B.Tech (Food.Engg) 2010 Admission
IVth Semester Final Examination- July -2013

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

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

Part I-Answer all questions $(10 \times \frac{1}{2} = 5$ marks$)$

1. If $f(x) = 0$ is of even degree and the constant term is negative, then the equation has only one negative root (True/ False).

2. If α, β, γ are the roots of $x^3 - 14x + 8 = 0$, then $\Sigma \alpha^2 = \ldots\ldots\ldots\ldots$.

3. What is the order of convergence in Newton-Raphson method?

4. Write down the relation between Δ and E.

5. The nth forward differences of a polynomial of degree n are................

6. Define the second divided difference of $f(x)$ for the arguments x_0, x_1, x_2.

7. What is the restriction for the number of intervals in Simpson's one third rule?

8. If a_1 and a_2 are distinct real roots, then the corresponding complementary function of

$f(E)y_x = 0$ is ....

9. The Euler's formula is $y(x + h) = \ldots\ldots\ldots\ldots$

10. The Poisson's equation $u_{xx} + u_{yy} = f(x, y)$ is an example for elliptic equation (True/ False).

Part II-Answer all questions $(5 \times 1 = 5$ marks$)$

1. Form the third degree equation, two of whose roots are $1 + i$ and 5.

2. What is the Truncation error in Trapezoidal rule?

3. Define central difference operator and shifting operator.

4. What is the order of $y_{x+3} - 5y_{x+2} + y_{x+1} = 0$?

5. Write Newton's forward interpolation formula.

Part III-Answer any 10 questions $(10 \times 3 = 30 \text{ marks})$

1. If α, β, γ are the roots of $x^3 + px^2 + qx + r = 0$, find the condition if $\alpha\beta = -1$.

2. Find an iterative formula to find $\sqrt{N}$, where N is a positive number by Newton-Raphson method.

3. Show that $\mu = \frac{1}{2}\left[E^{1/2} + E^{-1/2}\right]$.

4. Obtain the value of y at $x = 76$ from the following data:

x:	41	51	61	71	81	91
y:	20	24	29	36	46	51

5. Find the missing value of the following table:

x:	0	1	2	3	4
y:	1	2	4	–	16

6. Using Lagrange's interpolation formula, find the parabola of the form

   $y = ax^2 + bx + c$ passing through the points $(0, 0)$, $(1, 1)$ and $(2, 20)$.

7. The table below gives the velocity v of a moving particle at time t seconds. Find the acceleration at $t = 2$ second.

t:	0	2	4	6	8	10	12
v:	4	6	16	34	60	94	136

8. Evaluate $\int_{-3}^{3} x^4 dx$ by trapezoidal rule.

9. Define the terms (i) Solution (ii) General solution and (iii) Particular solution of a difference equation.

10. Find the particular integral of $y_{n+2} - 4y_{n+1} + 3y_n = 3^n$.

11. Classify the pde $xf_{xx} + xf_{yy} = 0, x > 0, y > 0$.

12. Write down Crank-Nicholson difference method? What is the purpose of it?

Part IV- Answer any 5 questions $\qquad$ **(5 × 6 = 30 marks)**

1. Transform the equation $x^4 - 8x^3 - x^2 + 68x + 60 = 0$ into one which does not contain the term x^3.

2. Use bisection method to find a positive root which lies in the interval (1, 2) of the equation $x^3 - x = 1$, correct to two decimal places.

3. Solve the system of equations by Gauss elimination method

   $x + 2y + z = 3,\ 2x + 3y + 3z = 10,\ 3x - y + 2z = 13$.

4. From the following table find $f(6)$ using Newton's divided difference formula:

   $x:\ \ 1\ \ 2\ \ 7\ \ 8$
   $y:\ \ 1\ \ 5\ \ 5\ \ 4$

5. Evaluate $I = \int\limits_{0}^{6} \dfrac{1}{1+x}\,dx$ using Simpson's rules and compare by direct integration.

6. Solve $y' = y - x^2;\ y(0) = 1$ by Picard's iteration method up to third approximation.

7. Compute y at $x = 0.25$ by Modified Euler method given $y' = 2xy;\ y(0) = 1$.

Part V- Answer any one question $\qquad$ **(1 × 10 = 10 marks)**

1. By Crout's method, solve the system

   $2x + 3y + z = -1,\ 5x + y + z = 9,\ 3x + 2y + 4z = 11$.

2. Using Runge-Kutta method of fourth order find $y(0.2)$ given that $y' = x + y;\quad y(0) = 1$

   (Take $h = 0.1$).