KERALA AGRICULTURAL UNIVERSITY

B.Tech (Food.Engg) Degree Programme 2012 & Previous Admission

IVth Semester Re- Examination- June-July -2016

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

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

Part I-Answer all questions **(10 × ½ = 5 marks)**

1. If $f(x)=0$ has no real root between a and b ($a < b$), then $f(a)$ and $f(b)$ are of same sign (True/ False).
2. If α, β, γ are the roots of $x^3+px^2+qx+r=0$, then $\sum\alpha\beta=$.............
3. Write down the relation between ∇ and E.
4. The $(n+1)^{th}$ difference of a polynomial of degree n is ....
5. Define the first divided difference of $f(x)$ for the arguments x_0, x_1.
6. The error in Simpson's one third rule is of order ....
7. The auxiliary equation corresponding to $y_{n+2}-4y_{n+1}+4y_n=0$ is ....
8. $\nabla(y_n) =$ __________
9. In Euler's method, the actual curve is approximated by a sequence of short straight lines (Yes/ No).
10. The Laplace equation $u_{xx}+u_{yy}=0$ is an example for parabolic equation (True/ False).

Part II-Answer all questions **(5 × 1 = 5 marks)**

1. Obtain the criteria of convergence in Newton-Raphson method.
2. Write the formula for Trapezoidal rule.
3. State Newton's forward interpolation formula.
4. Define difference equations
5. Classify the pde $\frac{\partial^2 u}{\partial x^2}+2\frac{\partial^2 u}{\partial x \partial y}+\frac{\partial^2 u}{\partial y^2}=0$.

Part III-Answer any 10 questions **($10\times3 = 30$ marks)**

1. Solve $x^3-15x^2+71x-105=0$ given that the roots of the equation are in A.P.

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

3. Find the root of $4x-e^x=0$ which lies between 2 and 3 by Newton-Raphson method.

4. Show that $\delta=E^{-1/2}\Delta$.

5. Find the sixth term of the sequence 8, 12, 19, 29, 42, ….

6. Obtain the divided difference table for

x:	0	1	2	4
y:	443	384	397	467

7. Use Lagrange's formula to fit a polynomial to the data

x:	-1	0	2	3
y:	-8	3	1	12

8. 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

9. Evaluate $\int_0^6 \frac{1}{1+x}dx$ using Simpson's 1/3rd rule.

10. Obtain the complementary function corresponding to $y_{x+2}-4y_x=9x^2$.

11. Determine the value of $y(0.1)$ by Euler's method, given that $y'=-y; y(0)=1$.

12. Find the real root of 3x-cosx -1 = 0 by Newton's Raphson method.

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

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

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 equation by Gauss-Jordan method

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

4. Estimate the population in the year 1946 if the population of a town is as follows:

Year x:	1941	1951	1961	1971	1981	1991
Population in lakhs y:	20	24	29	36	46	51

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

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

6. Find the value of $f'(x)$ at $x = 56$ from the following;

x:	50	51	52	53	54	55	56
$f(x)$:	3.684	3.7084	3.7325	3.7563	3.7798	3.8030	3.8259

7. Solve $\frac{dy}{dx} = x + y$ given $y(1) = 0$ and obtain $y(1.1)$ by Taylor series method.

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

1. By Crout's method, solve the system

   $x + y + z = 3,\ 2x - y + 3z = 16,\ 3x + y - z = -3.$

2. Using Runge-Kutta method of fourth order find $y(0.2)$ given that $y' = -y; y(0) = 1$ (Take h =0.1).
