

# KERALA AGRICULTURAL UNIVERSITY

B.Tech (Food.Engg.) 2013 Admission

One Time Re- Examination-February-2017

Cat. No: Basc.2204.

Title: Numerical Methods for Engineering Applications (1+1)

Marks: 50.00

Time: 2 hours

I Answer all questions

(10x1=10)

1. If  $\alpha, \beta, \gamma$  are the roots of  $x^3 - 3x + 2 = 0$ , then  $\sum \alpha^2 = \dots\dots\dots$ .
2. If  $a$  is a real root of  $f(x) = 0$  lies in  $[a, b]$ , then the sign of  $f(a) \cdot f(b)$  is  $\dots\dots\dots$ .
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  $\dots\dots\dots$ .
5. While solving the equation  $AX=B$ , by Gauss-Jordan method  $A$  is transformed into  $\dots\dots\dots$  matrix.
  - a. An upper triangular
  - b. A lower triangular
  - c. A diagonal
  - d. A unit matrix
6. The  $n^{\text{th}}$  difference of  $n^{\text{th}}$  degree polynomial is  $\dots\dots\dots$ .
7.  $E^n f(x) = \dots\dots\dots$ .
8. By Euler's method,  $y_n = \dots\dots\dots$ .
9. How many positive roots are there for the equation  $x^3 + x^2 + x - 100 = 0$ .
10. Newton's forward difference formula is applicable for  $\dots\dots\dots$  spaced points.

II Write short notes/answers on any FIVE of the following

(5x2=10)

1. State Lagrange's formula for interpolation.
2. Define the operators:  $E$  and  $\delta$ .
3. The Laplace's equation  $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$  is  $\dots\dots\dots$  equation.
4. Define particular solution.
5. Using Newton - Raphson method  $x - \cos x = 0$ .
6. Prove that  $\mu = \frac{\delta^2}{4} + 1$
7. Obtain the interpolation polynomial for the given data by using Newton's backward formula
  - x : 4   6   8   10
  - y : 1   3   8   16

**III Write short answers on any FIVE**

**(5x4=20)**

1. Using bisection method find a real root of  $xe^x - 3 = 0$ .
2. Determine a and b so that the equation  $x^4 - 4x^3 + ax^2 + 4x + b = 0$  has two pairs of equal roots. Find the roots.
3. Find the missing term, given  
x : 1   2   4   7  
y : 4   7   -   30
4. Using Simpson's rule evaluate  $\int_0^{\pi} \sin^3 x dx$  from the following data :  
x : 0             $\frac{\pi}{4}$              $\frac{\pi}{2}$              $\frac{3\pi}{4}$              $\pi$   
sinx : 0    0.7071    1    0.7071    0
5. Solve the difference equation  $y_{n+3} - 5y_{n+2} + 8y_{n+1} - 4y_n = 0$
6. Using Taylor series method, find y at  $x=0.1$ , given  $\frac{dy}{dx} = \frac{y}{2} + 3x, y(0) = 1$
7. Using Runge-Kutta method of order 2, find  $y(1.2)$  for the equation  
 $\frac{dy}{dx} = x^2 + y^2; y(1) = 1.5$

**IV Write essay on any ONE**

**(1x10=10)**

1. Evaluate  $\int_1^2 xe^x dx$  using Trapezoidal and Simpson's rule.
2. Using Euler's method, find the value of  $y(1)$  given  $\frac{dy}{dx} = x + y; y(0) = 1$  by choosing  $h = 0.1$ .

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