KERALA AGRICULTURAL UNIVERSITY
B.Tech. (Food Engg.)
One-Time Re-examination-January-2018
2014 Admission VII Semester

Basc.2209 Numerical Methods for Engineering Applications (1+1)

Marks: 50
Time: 2 hours

I Choose the correct answer (10x1=10)

1 While solving the equation $AX = B$, A is transformed into ---------------- matrix, by Gauss-Jordan method.

a An upper triangular b A lower triangular
c A diagonal d A unit matrix

2 The order of convergence of Newton-Raphson method

a 2 b 1 c 0 d None of these

Fill in the Blanks

3 If c_1 and c_2 are two real and distinct roots of an auxiliary equation, then the complimentary function is----------

4 If α, β and γ are the roots of $x^3 + 3x + 2 = 0$, then $\sum \alpha^2 = \cdots \dots \dots \dots$.

5 If a is a real root of $f(x) = 0$ lies in $[a, b]$ then the sign of $f(a) * f(b)$ is--------

6 The n^{th} difference of an n^{th} degree polynomial is---------

7 $E^{-n}f(x) = \cdots \dots \dots \dots \dots$

8 By Euler's method, $y_{n=\cdots}$.......................

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 -------------- spaced points.

II Answer any FIVE of the following (5x2=10)

1 State Lagrange' formula for interpolation

2 Define the operators: E and δ

3 Define particular solution.

4 Using bisection method find a real root of $xe^x - 3 = 0$

5 Using Newton-Raphson method $x - cosx = 0$

6 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.

7 Prove that $\mu = \frac{\delta^2}{4} + 1$

III Answer any FIVE of the following. (5x4=20)

1 Obtain the interpolation polynomial for the given data by using Newton's backward formula

x:	4	6	8	10
y:	1	3	8	16

2 Solve the difference equation $y_{n+3} - 5y_{n+2} + 8y_{n+1} - 4y_n = 0$

3 Using Taylor series method, find y at $x = 0.1$, given $\frac{dy}{dx} = \frac{y}{2} + 3x, y(0) = 1$

4 Using Runge-Kutta method of order 2, find $y(1.2)$ for the equation
$\frac{dy}{dx} = x^2 + y^2; \quad y(1) = 1.5$

5 Classify the equation $(1 + x^2)\frac{\partial^2 u}{\partial x^2} + (5 + 2x^2)\frac{\partial^2 u}{\partial x \partial t} + (4 + x^2)\frac{\partial^2 y}{\partial^2 t} = 0$

6 Evaluate $\int_1^2 xe^x \, dx$ using Trapezoidal and Simpson's rule.

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

IV Answer any ONE of the following (1x10=10)

1 Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 1.2$ from the following observations:

x	1.0	1.2	1.4	1.6	1.8	2.0	2.2
y	2.7183	3.3201	4.0552	4.9530	6.0496	7.3891	9.0250

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.

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