KERALA AGRICULTURAL UNIVERSITY
B.Tech.(Agrl. Engg.) 2021 Admission
III Semester Final Examination – February 2023

Sacs.2110   **Engineering Mathematics III (2+1)**   **Marks: 50**
Time: 2 hours

I **State True or False**   **(10x1=10)**

1. When the function is given in the form of table of values instead of giving analytical expression we use numerical differentiation.
2. Lagrange's interpolation formula is used only for equal intervals.
3. Bessel's method is given to central difference interpolation formula.
4. The order of convergence of Newton's-Raphson method is 2.
5. Runge-Kutta method of order four is single step method
6. Modified Euler's method is known as predictor-corrector method of finding the solution of first order differential equation.
7. The population or sample mean can be negative while the standard deviation may be positive or negative.
8. The sum of the squares of the deviations of a set of values is minimum when taken about mean.
9. The square of a standard normal variate is known as a chi-square variate with $n-1$ degree of freedom.
10. The assumption in analysis of variance is the same as Normal distribution.

II **Write short notes on ANY FIVE of the following**   **(5x2=10)**

1. When Newton's backward interpolation formula is used?
2. Obtain the divided difference table for the following data:

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

3. Write down the expressions of $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = x_0$ by Newton's forward difference formula.
4. State Taylor series algorithm for the first order differential equation.
5. State any two properties of normal distribution.
6. What is type-I and type-II error in testing of hypothesis?
7. What are the applications of F −test?

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

1. Find the polynomial which takes the following table:

x	0	1	2
y	1	2	1

2. The following data are taken from the steam table:

Temp ^{0}C	140	150	160	170	180
Pressure kgf/cm^2	3.685	4.854	6.302	8.076	10.225

Find the pressure at temperature at $t = 142$.

3. Using Trapezoidal rule, evaluate $\int_{-1}^{1} \frac{dx}{1+x^2}$ taking 8 intervals.

4. Find the mean and variance of the given data: 232, 254, 264, 274, 287, 298, 312, 342 and 398.

5. Two horses A and B were tested to run a particular track with the following results observed.

Horse A	28	30	32	33	33	29	34
Horse B	29	30	30	24	27	29	-

Test whether the two horses have the same running capacity.

6. Write down the ANOVA table for randomized block design.

7. Using Runge-Kutta method of 4th order solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ given that $y(0) = 1$ at $x = 0.2$.

IV   **Write an essay on ANY ONE of the following**   (1x10=10)

1. Solve $\frac{dy}{dx} = log_{10}(x + y)$, $y(0) = 2$ by Euler's modified method and find the values of $y(0.2)$ and $y(0.4)$ taking $h = 0.2$.

2. The following are the numbers of mistakes made in 5 successive days of 4 technicians working for a photographic laboratory:

Technician (I) (X_1)	Technician (II) (X_2)	Technician (III) (X_3)	Technician (IV) (X_4)
6	14	10	9
14	9	12	12
10	12	7	8
8	10	15	10
11	14	11	11

Test at the level of significance $\alpha = 0.01$ whether the differences among the 4 samples means can be attributed to chance.

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