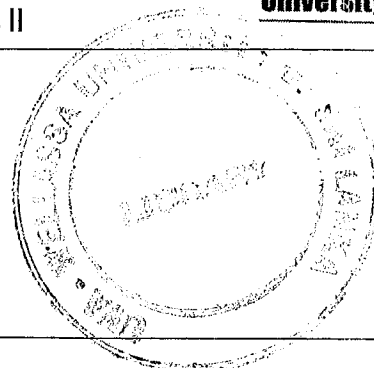


Uva Wellassa University of Sri Lanka
 Faculty of Science and Technology
 Department of Science and Technology
 300 Level 2nd Semester Examination – Dec./Jan. 2017
 SCT 302-2 Advanced Mathematics II



Instructions to candidates

Duration: Two(02) hours

Number of questions: Four(04) Essay Questions

Mark allocation: 100 mark

Use standard symbols without definition.

Scientific calculators are allowed.

Answer all questions

1.

- a. Find the real root, which lies between 0 and 1, of the equation $xe^x = \cos x$ using the **interval bisection method** to a tolerance of 10^{-3} . (10 mark)
- b. Solve the following system of equations by using **Cramer's rule**. (10 mark)

$$\begin{aligned} x + 3y - 4z &= 9 \\ 2x - y + z &= 3 \\ x + 2y - 5z &= 16 \end{aligned}$$

- c. Use the **Jacobi's method** to solve the following system;

$$\begin{aligned} 2x + 2y + z &= 1 \\ x + 3y + z &= 1 \\ x + 2y + 2z &= 7 \end{aligned}$$

where $x_1^{(0)} = -0.98, x_2^{(0)} = -0.98$ and $x_3^{(0)} = 4.97$. (10 mark)

2.

- a. Determine the **Lagrange's interpolating polynomial** of degree 3, which fits the following data and hence find an approximate value of $y(10)$. (15 mark)

x	-2	-1	2	3
y	-12	-8	3	5

- b. Compute the **Newton's divided difference** table for the following points, hence find $f(x)$ as a polynomial. (10 mark)

x	0	1	2
$f(x)$	2	1	0

(24)

3.

- a. Use most appropriate **three point formulas** to determine the approximate values of $\frac{dy}{dx}$ for $x = 1.0, 1.4$ and 2.2 from the following data. (Take $h = 0.2$) (15 mark)

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

- b. Evaluate

$$I = \int_0^1 \frac{1}{1+x^2} dx$$

using **mid-point rule** and **trapezoidal rule**.

(10 mark)

4.

- a. Use **Euler's method** to find a numerical approximation for $y(t)$ where

$$\frac{dy}{dx} = 1 + xy ; y(0) = 1$$

from $x=0$ to $x = 1$ using step size $h = 0.2$.

(08 mark)

- b. Calculate $y(0.1)$, using **Runge-Kutta second order method**,

$$\frac{dy}{dx} = 1 + y - x$$

given that $y = 1$ at $x = 0$.

(12 mark)