The Open University of Sri Lanka
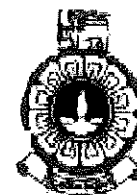
B.Sc/B.Ed Degree programme

Applied Mathematics – Level 03

ADU 3302- Differential Equations

No Book Test (NBT) - 2021/2022

Duration: One hour

Date: 28.01.2023	**Time: 01.00 p.m. – 02.00 p.m.**

Read the instructions carefully before attempt to answer the questions.

- This is a **One-hour** examination. Upload your answer script to the link provided by the Examination department.

- Only **one attempt** is allowed to submit the answer script. Write the page number and the registration number on each page.

- Arrange the answer sheets together, in ascending order and prepare a **single pdf file** as given in the instruction sheet provided to you earlier.

- Save your prepared pdf answer script with the file name "**Registration number_ADU3302**". Keep a copy of the submitted pdf file for yourself.

- **Make sure to enter the Course code, Registration number, NIC number, Name, and Telephone number correctly to the Answer Script Submission Form, which can be accessed through the given link.**

- **If you have any queries regarding submission, please contact: Online examination unit:** 070 1235772 / examsonline@ou.ac.lk (only for logging issues)
  Course conductor ADU3302: hoper@ou.ac.lk (0772935006) (for subject matters)

Answer All Questions

1. Nimal owns an ice coffee shop which opens in the evenings. Since he has a large group of customers, every morning he prepare a big pot of coffee which boiled up to 120^0 C. However, the pot of hot coffee cannot be directly put into the refrigerator. The refrigerator does not have the capacity to preserve any food item which is warmer than 30^0C. The pot is kept in a basin with cool water to reduce its temperature. The temperature of water in the basin is having constant temperature at 5^0C. Nimal observed that the pot takes 15 minutes to reduce its temperature into 55^0C.

   Find the time that consumes to make the pot of coffee ready to put into the refrigerator.

2. Find the general solution for the following initial value problem.

   $$\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 5y = 0, \ y(0) = 1, \ \frac{dy}{dx} = -1.$$

3. A radioactive material decays at a rate proportional to the amount present. Initially there are 50 milligrams of the material present and after one hour the material has lost 80% of its original mass.
   (a) Find the mass of the material as function of time.
   (b) Find the mass of the material after five hours.