

Question 1: A student decided to set up a stall at the university fair to sell handmade items. He creates custom t-shirts (T), mugs (M), and tote bags (B). His friends came to support his small side business, and the following purchases were made:

- Friend 1 bought 3 t-shirts, 2 mugs, and 4 tote bags for a total of 450 tk.
- Friend 2 bought 4 t-shirts, 3 mugs, and 2 tote bags for a total of 500 tk.
- Friend 3 bought 5 t-shirts, 2 mugs, and 3 tote bags for a total of 550 tk.

In total, the student earned 2500 tk by selling 50 t-shirts, 20 mugs, and 30 tote bags.

- a. [1 mark] Write down the linear equations that relate the variables T, M & B.
- b. [1 mark] Identify the matrices A, x, and b so that the equations in the previous question can be expressed in the standard matrix equation form $Ax = b$.
- c. [5 marks] From matrix A in the previous question, compute the matrices Q and R such that $A = QR$, where the symbols have their usual meanings.
- d. [3 marks] Evaluate QTb .

Question 2: A function is given by $f(x) = e^{0.5x}$ which is to be integrated on the interval $[0, 3]$.

- a. (2 marks) Evaluate the **exact integral** $I(f)$.
- c. (2 marks) Compute the numerical integral by using the **Simpson's Rule**.
- d. (4 marks) Evaluate the numerical integral $C_{1,4}$ by using the **Composite Newton-Cotes** formula and also find the **percentage relative error**.
- e. (2 marks) Which method gives you better results and why?