

Books, watches, notes or cell phones are **not** allowed. The **only** calculators allowed are the Sharp EL-531\*\*\*. You **must** show all your work, the correct answer is worth 1 mark the remaining marks are given for the work.

**Question 1.** (5 marks) Find the matrix  $M$  if

$$(5M + 4I)^{-1} = \begin{bmatrix} 7 & 2 \\ 4 & 1 \end{bmatrix}^T$$

**Question 2.** (4 marks) Suppose that  $A, B$  and  $C$  are invertible matrices. Solve for  $X$  and simplify as much as possible, where  $(2AC^T)^{-1}(CA^T)^T BX = B^{-1}D^T$ .

**Question 3.** (3 marks) Show that if a square matrix  $A$  satisfies the equation  $A^2 + 2A + I = 0$ , then  $A$  must be invertible. What is the inverse?