



Instructions to candidates:

Duration: **Three (3) hours**

Number of questions: **One (01)**

You are allowed to refer your own notes but **sharing notes is strictly prohibited**

Removable devices are **not allowed**

Mark allocation: **100**

1. You are requested to design an "Electronic Door Lock" using microcontroller programming. The complete requirements are specified below.

- i. The unlock code is comprised of **four (4) numeric** values. i.e. 5678.
- ii. Once the user enters the correct unlock code, the Seven Segments Display should display the message "PASS". Otherwise "FAIL".
- iii. Turn on the relay device if the unlock code is accepted.
- iv. Disable the keypad after **three (3)** consecutive unsuccessful attempts.

You are required to:

- a. Create a Proteus simulation project to simulate your embedded system design. You are required to use **PIC16F877A** as the microcontroller and "KEYPAD-PHONE" matrix key board as the input device.
- b. Write a **C** Program to fulfill the above specified requirements.
- c. Use the following schematic diagram for the Electronic Door Lock.
- d. After completion, ZIP the folder containing your Proteus simulation project and C program, rename it with your index number. (Follow the format: **EX_12_XXXX.**) Then upload to **Z Drive**.

