2025 END OF SEMESTER EXAMS – APPLIED ELECTRICITY 2

SECTION B

ESSAY (1 HOUR)

[50 marks]

Answer **five** questions only from this section. Write your answer in **ink** in your answer booklet. **All** questions carry equal marks.

1. A resistor with resistance of 30Ω, an inductor of inductive reactance 80Ω, and a capacitor of capacitive reactance 40Ω are connected in series with a 240V,50Hz a.c. supply.
   a. Draw a circuit diagram of the arrangement. [4 marks]
   b. Calculate the: i. total reactance ii. Impedance iii. Current [6 marks]

2. The table E below shows the values of a voltage wave over half a cycle.

Time (milliseconds)	0	10	20	30	40	50	60	70	80	90	100
Voltage (volts)	0	2	4	6	8	10	8	6	4	2	0

   a. using a graph sheet, plot a graph of voltage (vertical axis) against time (horizontal axis. [6 marks]
   b. From the graph plotted in (a) determine
      i. average value [2 marks]
      ii. root-mean-square value of the voltage [2 marks]

3. a. Define power factor in terms of electrical power. [2 marks]
   b. State four effects of low power factor in an electrical installation. [8 marks]

4. A load consists of three star-connected coils each having 9Ω resistance and 12Ω reactance. It is connected to a three-phase 440V,50Hz supply. Calculate
   a. Line current
   b. Power factor
   c. Total power (in kw) [10 marks]

5. The no-load current of a transformer is 5.0A AT 0.3 power factor when supplied at 230V, 50Hz. The number of turns on the primary winding is 200, calculate the
   a. Core loss [5 marks]
   b. Magnetizing current [5 marks]

6. a. with the aid of a circuit diagram, explain the principle of operation of a single-phase transformer.
   b. sketch the diagram of the following:
   i. Shell-type transformer ii. Core-type transformer [10 marks]