

**FEDERAL UNIVERSITY OF TECHNOLOGY MINNA, NIGER STATE**  
**SCHOOL OF SCIENCE AND TECHNOLOGY EDUCATION**  
**DEPARTMENT OF INDUSTRIAL AND TECHNOLOGY EDUCATION**  
**FIRST SEMESTER 2019/2020 ACADEMIC SESSION EXAMINATION**

Course Title: Principle of Electricity: ITE 214, Time: 1 hour 30 minutes

INSTRUCTION: Answer 3 Questions Only

1a. List and Explain the factors that affect resistance of a given conductor

resistance  $R = \frac{\rho l}{a}$  ohms

1b. Follow appropriate procedure, derive that

1c. Some copper wire has a resistance of 200 at 20°C. A current is passed through the wire and the temperature rises to 90°C. Determine the resistance of the wire at 90°C, correct to the nearest ohm, assuming that the temperature coefficient of resistance is 0.004/°C at 0°C

2a. State one application each of series and parallel connections of lamps

2a. Three lamps, each rated at 240 V, connected in (i) series and (ii) parallel across a 240 V supply. Explain what happen the lamps or the circuits when (a) the switches of the two circuits are on (b) one of the lamps is removed from the circuits(c) an additional one lamp of equal ratings is added to the lamps in the two circuits.

2c. For the circuit shown in Figure 2 calculate (a) the value of resistor Rx such that the total power dissipated in the circuit is 2.5 kW, and (b) the current flowing in each of the four resistors.

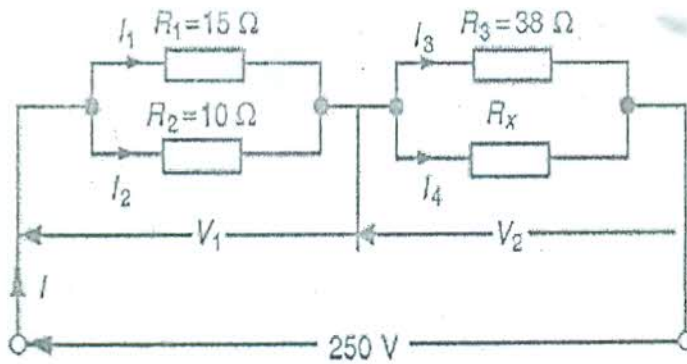


Figure 2.

3a. Define the following terms

- |                           |                   |
|---------------------------|-------------------|
| i. Root mean square value | iv. Periodic time |
| ii. Mean value            | v. frequency      |
| iii. Instantaneous value  |                   |

3b. with a suitable sine waveforms, distinguish between unidirectional waveforms and alternating waveforms

3c. An alternating current varies with time over half a cycle as follows:

Current (A)	0	0.7	2.0	4.2	8.4	8.2	2.5	1.0	0.4	0.2	0
Time (S)	0	1	2	3	4	5	6	7	8	9	10

The negative half cycle is similar. Plot the curve and determine: (a) the frequency (b) the instantaneous values at 3.4 ms and 5.8 ms (c) its mean value and (d) its rms value

4a. Define the following terms

- i. Impedance      ii. Capacitive Reactance      iii. Inductive Reactance

4b. In ac circuit, what are the conditions for a series resonance to occur

4c. The following three impedances are connected in series across a 40 V, 20 kHz supply: (i) a resistance of  $8\Omega$ , (ii) a coil of inductance  $130\mu\text{H}$  and  $5\Omega$  resistance, and (iii) a  $10\Omega$  resistor in series with a  $0.25\mu\text{F}$  capacitor. Calculate (a) the circuit current, (b) the circuit phase angle and (c) the voltage drop across each impedance

5a. Define Selectivity

5a. Explain the following terms

- i. Q factor      ii. Apparent power      iii. True or active power      iv. Reactive power

5c. The power taken by an inductive circuit when connected to a 120 V, 50 Hz supply is 400 W and the current is 8 A. Calculate (a) the resistance, (b) the impedance, (c) the reactance, (d) the power factor, and (e) the phase angle between voltage and current.