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**FEDERAL UNIVERSITY OF TECHNOLOGY MINNA, NIGER STATE**  
**SCHOOL OF SCIENCE AND TECHNOLOGY EDUCATION**  
**DEPARTMENT OF INDUSTRIAL AND TECHNOLOGY EDUCATION**  
**FIRST SEMESTER 2021/2022 ACADEMIC SESSION EXAMINATION**

**Course Title: Principles of Electricity: ITE 214, Time: 2 hours**  
**INSTRUCTION: Answer 3 Questions Only**

- 1a. Define temperature coefficient of resistance of a material  
 1b. list and explain factors that affect resistance of conductor

1c. The resistance of a coil of aluminium wire at 18°C is 200 . The temperature of the wire is increased and the resistance rises to 240Ω . If the temperature coefficient of resistance of aluminium is 0.0039/°C at 18°C determine the temperature to which the coil has risen.

$$\frac{V}{R} = \frac{V}{R_1} + \frac{V}{R_2} + \frac{V}{R_3}$$

2a. In parallel circuit, derive an expression that using appropriate circuit diagram

2b. Given four 1Ω resistors, state how they must be connected to give an overall resistance of (a) ¼ Ω (b) 1Ω (c) 11/3Ω (d) 2 ½ Ω, all four resistors being connected in each case.

2c. Two resistors are connected in series across a 24 V supply and a current of 3 A flows in the circuit. If one of the resistors has a resistance of 2Ω, determine (a) the value of the other resistor, and (b) the p.d. across the 2Ω resistor. If the circuit is connected for 50 hours, how much energy is used

3a. Define the following terms

i. Frequency ii periodic time iii. Instantaneous values iv. Peak value v. form factors for sine wave and state their unit of measurement where necessary

3b. Determine the frequencies for periodic times of (i) 4 ms, (ii) 4 μs

3c. The following table gives the corresponding values of current and time for a half cycle of alternating current.

time t (ms)	0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Current i (A)	0	7	14	23	40	56	68	76	60	5	0

Assuming the negative half cycle is identical in shape to the positive half cycle, plot the waveform and find (a) the frequency of the supply, (b) the instantaneous values of current after 1.25 ms and 3.8 ms, (c) the peak or maximum value, (d) the mean or average value, and (e) the rms value of the waveform.

4a. Define the following terms, state their symbol and units of measurement.

4b. i. Derive a formular for resonant frequency iii. Explain what happens at series resonant

4c. A coil having a resistance of 10Ω and an inductance of 125 mH is connected in series with a 50 μF capacitor across a 120 V supply. At what frequency does resonance occur? Find the current flowing at the resonant frequency

Inductive reactance  
 Capacitive reactance  
 Reactive power

$4 \div \frac{4}{3} = 4 \times \frac{3}{4}$

$$\frac{1}{\frac{1}{4}} = \frac{1}{\frac{1}{4/3}} + \frac{1}{\frac{1}{4/3}} + \frac{1}{\frac{1}{4/3}} + \frac{1}{\frac{1}{4/3}}$$

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