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**University Examinations 2015/2016**

SECOND YEAR SECOND SEMESTER EXAMINATION FOR DIPLOMA IN ELECTRICAL ENGINEERING

**EEE 2250: ELECTRICAL ENGINEERING PRINCIPLES IV**

**DATE: NOVEMBER 2015 TIME: 11/2 HOURS**

**INSTRUCTIONS:** *Answer question* ***one*** *and any other* ***two*** *questions*

**QUESTION ONE (30 MARKS)**

1. With the aid of a phasor diagram explain the essential features in the representation of an unsymmetrical three phase system of voltages VR VY and VB by symmetrical components (3 Marks)
2. The following currents were recorded in the R, Y and B lines of a 3 phase system under abnormal conditions.

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Calculate:

1. Positive phase sequence components. (5 Marks)
2. Negative phase sequence components. (5 Marks)
3. Zero phase sequence components. (3 Marks)
4. Return current in the neutral conductor. (2 Marks)
5. Define the term transients. (1 Mark)
6. Define the term time constants as applied to transients. (1 Mark)
7. The voltage V=200 sin (314t+30o) is suddenly applied at t=0 to a circuit consisting of a 10 Ω resistor in series with a 0.1 H inductor.
8. Deduce an equation showing how the current varies with time. (7 Marks)
9. Calculate the value of current 0.025 seconds after switching on. (3 Marks)

**QUESTION TWO (15 MARKS)**

1. State three conditions necessary for the production of transients. (3 Marks)
2. An indicator has a negligible resistance and an inductance of 250 mH and is conncected in series with a 500Ω resistor to a 24V, dc supply.

Determine:

1. The time constant of the circuit. (2 Marks)
2. The steady stale value of the current flowing in the circuit. (2 Marks)
3. The voltage drop across the inductor at a time equal to two time constants. (2 Marks)
4. The voltage drop across the resistor after a time equal to three time constants. (3 Marks)
5. The expected time for the current to rise to 12% of its final value. (3 Marks)

**QUESTION THREE (15 MARKS)**

1. State and explain five types of transients. (5 Marks)
2. A 20capacitor is connected in series with a 10kΩ resistor and the circuit is connected to a 40 dc supply.

Determine:

1. The initial value of the current flowing. (1 Mark)
2. The time constant of the circuit. (2 Marks)
3. The value of the current one second after connection. (2 Marks)
4. The value of the capacitor voltage 0.4 seconds after connection. (2 Marks)
5. The time after connection when the resistor voltage is 6V. (3 Marks)

**QUESTION FOUR (15 MARKS)**

Given that V0=10<102o, V1=13.5< -90o, V2=48<117o,

1. Find the phase sequence components taking red phase as the reference. (12 Marks)
2. Sketch vector diagram representing the positive, negative and zero sequence components for the B phase. (3 Marks)