Title: **AC Measurement** Worksheet: 24

Course: Electrical Applications Unit: Electrical Theory CLO: 3

Name ANSWER KEY Grade 124pts. Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Objectives**

1. Student shall determine the types of measurement associated with an AC source.
2. Student shall calculate various AC quantities base on the given information.

**Assessment**

Students shall demonstrate a comprehension of the objectives listed above by scoring a minimum of 75% on this Worksheet. Grading shall be based on an answer key.

**Theory**

An AC sine wave can be measured in three basic methods. A forth method shall be discussed as well. An AC sine wave that represents the voltage has three basic measurements; peak voltage (EP), peak to peak voltage (EPP), and root-mean-square voltage (ERMS). Below is a graphic displaying each.



90˚

360˚

180˚

270˚

0V

EP – From x axis to maximum (peak) amplitude.

EPP – From maximum (peak) amplitude to minimum (-peak) amplitude

ERMS – Root, Mean, Square of waveform

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |

Because the cycles of voltage correspond to the rotation of a generator, a cycle is expressed as 360˚. A fourth method is a calculation that produces the instantaneous voltage at a specific location on the sine wave. The point at which the voltage is read is denoted in degrees. Below is the formula to calculate the instantaneous voltage at a given degree.

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |

Where;

EI – Instantaneous voltage @ θ˚.

EP – From x axis to maximum (peak) amplitude.

θ – Angle of rotation/point of sinewave the voltage occurs

**Circuit**



**Instructions**

Complete the tables below based on the information given and the formulas on page 1.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | P | I | R | ERMS | EP | EPP |
| R1 | 441.235mW | 16mA | 1.724kΩ | 27.577V | 39V | 78V |
| R2 | 2.399W | 87mA | 316.979Ω | 27.577V | 39V | 78V |
| Total | 2.84W | 103mA | 267.738Ω | 27.577V | 39V | 78V |

**Circuit**



|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | P | I | R | ERMS | EP | EPP |
| R1 | 7.68W | 480mA | 33.333Ω | 16V | 22.627V | 45.255V |
| R2 | 9.6W | 600mA | 26.667Ω | 16V | 22.627V | 45.255V |
| R3 | 5.12W | 320mA | 50Ω | 16V | 22.627V | 45.255V |
| Total | 22.4W | 1.4A | 11.429Ω | 16V | 22.627V | 45.255V |

**Circuit**



|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | P | I | R | ERMS | EP | EPP |
| R1 | 32.283mW | 5.682mA | 1k | 5.682V | 8.035V | 16.071V |
| R2 | 180.785mW | 5.682mA | 5.6kΩ | 31.818V | 45.998V | 89.995V |
| R3 | 71.023mW | 5.682mA | 2.2k | 12.5V | 17.678V | 35.355V |
| Total | 284.091mW | 5.682mA | 8.8k | 50V | 70.711V | 141.421V |

**Circuit**



Where;

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | P | I | R | ERMS | EP | EPP |
| R1 | 87.17mW | 6.295mA | 2.2kΩ | 13.848V | 19.584V | 39.139V |
| R2 | 73.302mW | 3.743mA | 3.7kΩ | 13.848V | 19.584V | 39.139V |
| R3 | 11.038mW | 2.347mA | 5.9kΩ | 13.848V | 19.584V | 39.139V |
| Total | 171.51mW | 12.385mA | 1.118kΩ | 13.848V | 19.584V | 39.139V |

**Circuit**



Where;

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | P | I | R | ERMS | EP | EPP |
| R1 | 13.67mW | 512μA | 52.148kΩ | 26.7 | 37.76V | 75.52V |
| R2 | 19.61mW | 512μA | 74.805kΩ | 38.3V | 54.165V | 108.329V |
| R3 | 11.52mW | 512μA | 43.945kΩ | 22.5V | 31.82V | 63.64V |
| Total | 44.8mW | 512μA | 170.898kΩ | 87.5V | 123.745V | 247.487V |