NATIONAL CERTIFICATE MODULE DESCRIPTOR

-Module Number-	**2160040**	**-Session-**	**1990-91**
-Superclass-	**XK**		

-Title-   **TRANSFORMATION AND RECTIFICATION (x½)**

-DESCRIPTION-

Purpose

This module is designed to introduce the student to the principles of electrical transformation and rectification.

The module is written for electrical craft and technician students but can also be used by craft and technician students from other technology related backgrounds.

Preferred
Entry Level

2160030 Single Phase ac.

Outcomes

The student should:

1.   apply the relationship between turns ratio, voltage ratio and current ratio for two ideally coupled coils;

2.   interpret output waveshapes of basic rectifier circuits.

Assessment
Procedures

Acceptable performance in the module will be satisfactory achievement of all the Performance Criteria specified for each Outcome.

The following abbreviations are used below:

PC   Performance Criteria
IA   Instrument of Assessment

Note: The Outcomes and PCs are mandatory and cannot be altered. The IA may be altered by arrangement with SQA. (Where a range of performance is indicated, this should be regarded as an extension of the PCs and is therefore mandatory.)

OUTCOME 1   **APPLY THE RELATIONSHIP BETWEEN TURNS RATIO, VOLTAGE RATIO AND CURRENT RATIO FOR TWO IDEALLY COUPLED COILS**

PCs

(a)   The relationship between induced emf and the rate of change of flux linkage is developed correctly as

$$e = \frac{N \times \text{flux change}}{\text{time}}$$

(b)   The relationship between turns ratio and voltage ratio for two ideally coupled coils is developed correctly as

$$e_1/e_2 = N_1/N_2$$

(c)   The relationship between voltage ratio and current ratio for two ideally coupled coils is developed correctly as

$V_1/V_2 = I_2/I_1$ using the ideal power transfer equation $P_1 = P_2$

(d)   The turns/voltage/current relationships are applied correctly.

IA   Short Answer Questions

The student will be presented with a test comprising ten short answer questions to be allocated as follows:

(i)   principles of induced emf as rate of change of flux linkage   (2)

(ii)   application of turns/voltage ratio   (2)

(iii)   application of voltage/current ratio   (2)

(iv)   application of turns/ voltage/current relationship   (4)

Satisfactory achievement of the Outcome is based on the student producing six correct responses including one each for parts (i), (ii) and (iii) and three for (iv).

An incorrect response is one which shows a lack of understanding and is not caused by trivial arithmetic error.

OUTCOME 2   **INTERPRET OUTPUT WAVESHAPES OF BASIC RECTIFIER CIRCUITS**

PCs

(a)   The concept of rectification is explained correctly using the unidirectional property of a diode.

(b)   A half-wave rectified output waveform is obtained correctly in practical conditions.

(c)   Full-wave rectified output waveforms are obtained correctly.

(d)   Output waveshapes are accurately drawn for (b) and (c).

(e)   The shape of the output waveform is correctly explained in relation to the principle of operation of the appropriate circuit.

IA   Assignment

Given suitable components including resistive loads, and circuit diagrams for half-wave rectification, full-wave rectification using 2 diodes and full-wave rectification using a 4 diode bridge the student will be required to:

(i)   explain the use of a diode as a rectifiying device
(ii)   connect each circuit correctly
(iii)   apply a given sinusoidal input voltage
(iv)   given an oscilloscope set to the appropriate scales obtain relevant output waveforms
(v)   sketch the three output waveshapes in relation to the input waveshape
(vi)   comment on the output waveshape for each case.

The exercise will be carried out in conjunction with a suitably constructed observation checklist covering all practical elements of the assessment.

Satisfactory achievement is based on all the Performance Criteria being met.

The following sections of the descriptor are offered as guidance.
They are not mandatory.

CONTENT/CONTEXT

Appropriate units, symbols and unit-symbols should be used throughout.

Corresponding to Outcomes 1-2:

1.   Transformation: Relationship between induced emf. and rate of flux linkage ie.,
$e_1 = N_1$ x flux change/time and $e_2 = N_2$ x flux change/time for two coils which are
linked by the same flux.

        Voltage Ratio:

        Use of fact that volts per turn is same for each winding to give $E_1/N_1 = E_2/N_2$

        $V_1/V_2 = N_1/N_2$

        Current ratio:

        since power in = power out

        $V_1 I_1 = V_2 I_2$

        $V_1/V_2 = I_2/I_1$

        transformation ratios

        $V_1/V_2 = N_1/N_2 = I_2/I_1$

2.   Rectification: Concept of rectification explained using unidirectional property of a
        diode. Output waveforms of common rectifier circuits ie., half-wave, full-wave using 2
        diodes and full-wave bridge.

SUGGESTED LEARNING AND TEACHING APPROACHES

1.   Exposition lessons followed by demonstration and discussion. Student-centred worksheets including self-assessed questions (S.A.Q.'s) and tutorial.

2.   Exposition lessons followed by student-centred practical activity using worksheets in which appropriate data derived from activity is entered and conclusions drawn.