BASIC ELECTRONICS

For candidates in Nigeria only

EXAMINATION SCHEME

There will be three papers, Papers 1, 2 and 3, all of which must be taken. Papers 1 and 2 shall be a composite paper to be taken at one sitting.

PAPER 1: will consist of fifty multiple-choice objective questions all of which are to be answered in 1 hour for 50 marks.

PAPER 2: will consist of seven short-structured questions. Candidates will be required to answer any five in 1 hour for 50 marks.

PAPER 3: will be a practical paper of two experiments both of which are to be carried out by candidates in 3 hours for 100 marks.

SAMPLE QUESTIONS

PAPER 1

OBJECTIVE

1. The decimal equivalent of the binary number 1000₂ is
   A. 12.
   B. 11.
   C. 9.
   D. 8.

2. Modulation is a process in which
   A. radio signal travels between two transmitters.
   B. telephone subscribers are connected to one other.
   C. audio signals are carried over radio waves.
   D. audio signals are amplifier.

3. Which of the following electrical appliances operates on the principle of a closed-loop system?
   A. Immersion heater
   B. Refrigerator
   C. Electric fan
   D. Electric kettle
Use figure 1 to answer Questions 4 and 5.

\[ C_1 = 10 \, \mu F \]

\[ C_2 = 10 \, \mu F \]

\[ C_3 = 20 \, \mu F \]

Figure 1

4. The total capacitance between X and Y is
   A. 10.0 \, \mu F.
   B. 20.0 \, \mu F.
   C. 30.0 \, \mu F.
   D. 40.0 \, \mu F.

5. The total capacitance when \( C_3 \) is removed from the circuit is
   A. 2.0 \, \mu F.
   B. 5.0 \, \mu F.
   C. 10.0 \, \mu F.
   D. 20.0 \, \mu F.

**PAPER 2 ESSAY**

1.(a) (i) Draw the circuit diagram of a Colpitts oscillator
   (ii) Label any three parts of the figure in 1a(i).
   (b) Explain the working principle of a Colpitts oscillator.

2. (a) (i) With the aid of sketches, distinguish between dynamic and electrostatic transducers.
   (ii) State two advantages of electrostatic transducers over dynamic transducers.
   (c) List two electromechanical transducers.
PAPER 3
PRACTICAL

Apparatus

one 12 V d.c. power supply;
one 12 V, 1 A a.c. power supply;
one d.c. voltmeter (0 – 12 V);
one a.c. voltmeter (0 – 12 V);
one d.c. ammeter (0 – 10 A);
one a.c. milliammeter (0 – 100 mA);
one decade resistance box $R_b$ (0 – 200 Ω);
one 40 W choke;
one single-pole switch;
one set of handtools;
connecting wires.

1. AIM: To determine the resistance of a choke.

(a) Connect the circuit as shown in Fig. 1
(b) Ask the supervisor to check the circuit connection.
(c) Copy Table 1 into your answer booklet.
Table 1

<table>
<thead>
<tr>
<th>$R_b (\Omega)$</th>
<th>I(A)</th>
<th>$V_L (V)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
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<tr>
<td>20</td>
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<td>30</td>
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<tr>
<td>60</td>
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</tr>
<tr>
<td>70</td>
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</tbody>
</table>

(d) Close switch S.
(e) Read and record in Table 1 the readings on the ammeter A and voltmeter $V_L$.
(f) Open switch S.
(g) Increase the resistance value of $R_b$ in steps of 10 Ω.
(h) Repeat steps (d) to (g) for up to 70 Ω as shown in Table 1.
(i) Plot a graph of voltage $V_L$ (V) on the vertical axis against current I (A) on the horizontal axis.
(j) Determine the gradient of the graph.