Name: _____ Index No. _____/_____

1204/312
ELECTRONIC INSTRUMENTS
AND FAULT DIAGNOSIS (THEORY)
June/July 2013
Time: 3 hours

Candidate's Signature: _____

Date: _____

THE KENYA NATIONAL EXAMINATIONS COUNCIL

ELECTRONIC CRAFT COURSE

ELECTRONIC INSTRUMENTS AND FAULT DIAGNOSIS (THEORY)

3 hours

INSTRUCTIONS TO CANDIDATES

Write your name and index number in the spaces provided above.
Sign and write the date of the examination in the spaces provided above.
You should have the following for this examination:
Mathematical tables/Calculator
*Answer **ALL** the **FIVE** questions in the spaces provided in this question paper.*
All questions carry equal marks.
Do not remove any pages from this booklet.
Candidates should answer all the questions in English.

For Examiner's Use Only

Question	1	2	3	4	5	TOTAL
Marks						

This paper consists of 16 printed pages.

Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

Turn over

1. (a) (i) State **four** precautions to be observed when tracing for faults in a digital system.

(ii) With the aid of a diagram describe short-circuit fault location between two logic signal lines using a signal generator and a current-sensing probe.

(11 marks)

(b) For the TTL logic circuit of figure 1, explain the effects of the following faults and hence deduce the state of the LED indicator:

(i) break (open - circuit) in the pcb track between pins 3 and 10;
(ii) output of gate C stuck to "O";
(iii) pin 7 open circuit.

(9 marks)

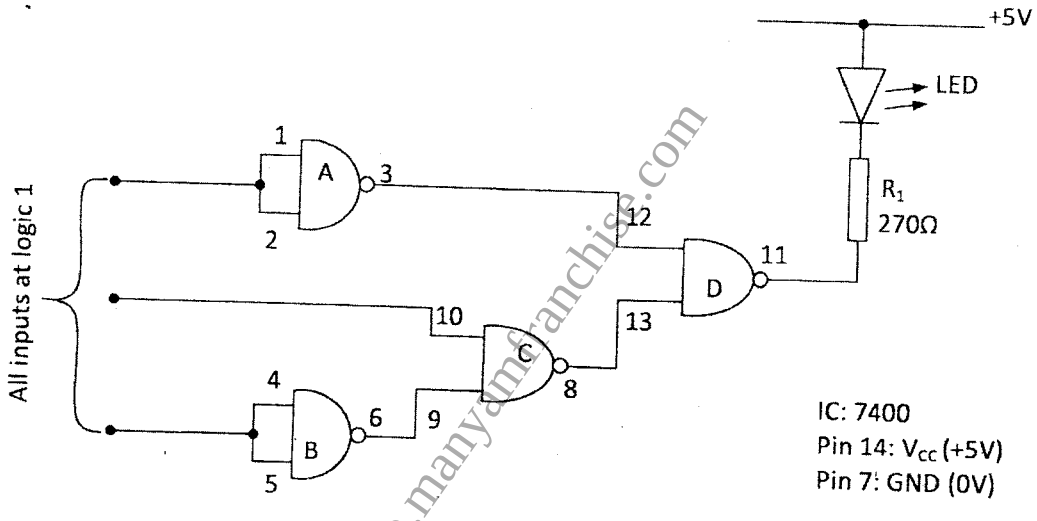

Figure 1

2. (a) (i) State any **two** symptoms for each of the following faults in a TV receiver:

I. loss of high voltage (HV),
II. failure of the sync separator,
III. defect in the deflection yoke.

(ii) Describe the effects of open circuit in the bypass capacitors connected in parallel with each rectifier diode in the power supply section of a TV receiver.

(10 marks)

(b) For a TV receiver:

(i) state any **three** precautions to be taken when installing the picture tube;

(ii) describe the effects of loss of vacuum in the picture tube on the receiver performance.

(8 marks)

(c) The IF section of a TV receiver has an input of 0.2 mV and an output of 2V. Determine the voltage gain, in decibels, of the section. (2 marks)

3. (a) List **two** faults in variable resistors and their causes. (4 marks)

(b) State the effects of the following faults in small signal transistor amplifiers:

(i) open circuit coupling capacitors;

(ii) bias resistors open circuit or change to high value;

(iii) short circuit decoupling capacitors;

(iv) open collector.

(8 marks)

(c) For the bridge network of figure 2, obtain the expression for C_1 and R_1 under balance conditions and hence determine their values. (8 marks)

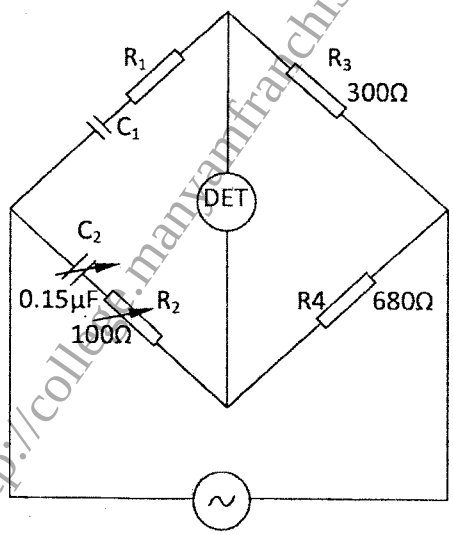

Figure 2

4. (a) State any **two** causes of each of the following faults in a radio receiver:

(i) motor boating;

(ii) noisy reception;

(iii) short battery life.

(6 marks)

(b) Outline the procedure of aligning the local oscillator of an AM radio receiver.

(7 marks)

(c) The collector load of a radio frequency amplifier consist of a parallel-tuned circuit, the inductor of which has a value of 150 μH. If the Q-factor of the tuned circuit is 100, determine the:

(i) value of capacitor required to tune the amplifier to a frequency of 1MHz;
(ii) 3dB bandwidth of the tuned circuit.

(7 marks)

5. (a) Sketch the waveforms for each of the following test signals:

(i) double sideband amplitude modulated wave;

(ii) sinusoidal wave;

(ii) stair case ramp.

(6 marks)

(b) (i) Explain how an oscilloscope may be calibrated by use of an external signal source;

(ii) A voltmeter has a sensitivity rating of 20 kΩ/v. Determine the resistance of this voltmeter when set to the 250 V range.

(6 marks)

(c) A 100kHz carrier wave is amplitude modulated by a 3kHz sinusoidal signal:

(i) Determine the:

I. lower side frequency;

II. upper side frequency;

III. bandwidth required to transmit the modulated wave.

(iii) Sketch the frequency spectrum of the modulated wave.

(8 marks)