CEL & ETL : General Electronics

**T048** 

Friday, 01/11/2013 1:30 - 4:30 PM WORKFORCE DEVELOPMENT AUTHORITY



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# ADVANCED LEVEL NATIONAL EXAMINATIONS, 2013, TECHNICAL AND PROFESSIONAL TRADES

**EXAM TITLE**: General Electronics

**OPTIONS**:

- Computer Electronics (CEL)

- Electronics and Telecommunication (ETL)

**DURATION:** 3hours

#### **INSTRUCTIONS:**

The paper contains three (3) sections:

Section I: Sixteen (16) questions, all Compulsory;

55marks

Section II: Five (5) questions, Choose any three (3);

45marks

Section III: Three (3) question, choose any ONE (1)

15marks

### Section I: Attempt all the 12 questions 55marks

- o1. Define: a) Crossover Distortion
- b) Threshold voltage

3marks

- c) Pinched-off phenomena
- 02. Differentiate Depletion Type from Enhancement Type of Field Effect Transistor.

4marks

- o3. Two coils connected in series have a resistance of  $18 \Omega$ , and when connected in Parallel have a resistance of  $4\Omega$ . Find the value of resistances.
- **04.** With the mathematical expressions explain the relationship between alpha and beta

3marks

os. Differentiate a BJT from a FET.

3marks

- o6. Determine the Voltage, Current and Power Gain of an amplifier that has an input signal of 1mA at 10mV and a corresponding output signal of 10mA at 1V. Express all three gains in decibels, (dB).3marks
- **07.** Differentiate the oscillator from amplifier.

5marks

**08.** List out the conditions to turn-on Bipolar Junction Transistor.

2marks

- **o9.** Define the following terms: a) Phototransistor
- b) Opto-Coupler

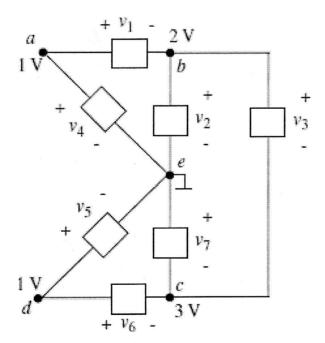
3marks

10. What is the main advantage of a crystal oscillator?

1mark

11. Consider the following circuit. Determine the voltages  $V_1$ ,  $V_2$ ,  $V_3$ ,  $V_4$ ,  $V_5$ ,  $V_6$ , and  $V_7$ 

7marks



- 12. What is the behavior of an amplifier provided with current series feedback? 2marks
- 13. Identify 5 different types of voltage regulators.

5marks

14. What are the main considerations which are to be kept in view while selecting an oscillator for a particular application?

5marks

15. Why t is he fan-out of a MOS-logic gate higher than that of TTL gates?

1 mark

**16.** Simplify the following expression using Boolean algebra properties.

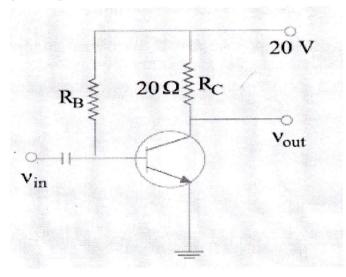
4marks

 $\mathbf{Z} = \overline{\mathbf{X}}\mathbf{Y} + \mathbf{X}\overline{\mathbf{Y}} + \mathbf{X}\mathbf{Y}$ 

#### Section II: Choose and Answer any three (3) questions 30marks

- 17. A) For the class-A, CE amplifier circuit of Figure below, VCEQ = 10 V and ICQ = 500 mA. If collector i.e. output current varies by ± 250 mA when an input signal is applied at the base, compute:
  - i) Total dc power taken by the circuit,
- v) Overall efficiency.
- ii) DC power dissipated by the collector load, vi) Collector efficiency.
- iii) AC power developed across the load,
- vii) Power delivered to the transistor,
- iv) DC power wasted in transistor collector,

7marks



- B) Choose the best answer for the following statements: Write in full words the chosen correct answer. Ex: A relaxation oscillator is one which .....
  - I. A relaxation oscillator is one which

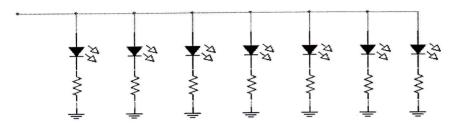
1mark

a) has two stable states

- b) relaxes indefinitely
- c) produces non-sinusoidal output
- d) oscillates continuously.
- II. In RC phase-shift oscillator circuits, ......
- 1 mark

1mark

- a) there is no need for feedback
- b) feedback factor is less than unity
- c) pure sine wave output is possible d) transistor parameters determine oscillation
- III. Where bridge oscillator is most often used whenever .....
- a) high feedback ratio is needed
- b) square output waves are required
- c) wide range of high purity sine waves is to be generated
- d) extremely high resonant frequencies are required.
- 18. a) Calculate the resonant frequency of a Wien Bridge oscillator when R = 10 k  $\Omega$ 4marks and C = 2400 pF.
  - b) Design RC elements of a Wien Bridge oscillator, for operation at 2.5 kHz. 4marks
  - 2marks c) Can an ordinary diode be used as a zener diode? Justify your answer.
- 19. Consider the following circuit and determine the value of each resistance if the power source supplies 5V<sub>DC.</sub> Assume that each diode is characterized by the maximum current of 40mA which cause 1.4VDC. What can be the application of such circuit?



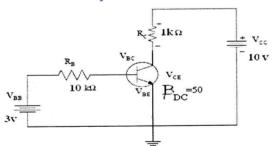
- 20. a) Identify the measurement unit of the following variables and indicate the symbol for the variable and for the corresponding unit.

  9marks
  - i) Pulse
- ii) Admittance
- iii) Phase
- b) Why a good voltmeter must have a high value of internal resistance? 1mark
- 21. The following signal is shown on an oscilloscope screen. If the device is adjusted such that the time base is 5 ms/div and vertical sensibility is 2 V/div. Determine Amplitude of the signal, period and frequency.



## Section III: Choose and Answer any one (1) question 15marks

22. Determine whether or not the transistor in figure bellow is in saturation.Assume VCE (sat) = 0.2.15marks



23. a. What is cut-in voltage in semiconductor?

3marks

**b.** Distinguish between <u>forward active</u>, <u>saturation</u>, <u>cut-off</u> and <u>reverse active operation</u> of a transistor.

12marks

b)

24. The output of the circuit b) is connected to the input of the circuit a). If on the inputs of b) is applied a sequence of these numbers (from down to up): A=0000; B= 0001; C=0011; D=0010; E= 0110; determine the outputs of each circuit and make a conclusion.
15marks

