

T060

Monday, 16/11/2015

08:30 – 11:30



**ADVANCED LEVEL NATIONAL EXAMINATIONS, 2015,
TECHNICAL AND PROFESSIONAL TRADES**

EXAM TITLE: General Electronics

OPTIONS: - Computer Electronics (CEL)
- Electronics and Telecommunication (ETL)

DURATION: 3hours

INSTRUCTIONS:

The paper is composed of **three (3) Sections:**

Section I: Fifteen (15) questions, all **Compulsory.** **55marks**

Section II: Five (5) questions, **Choose Three (3) only.** **30marks**

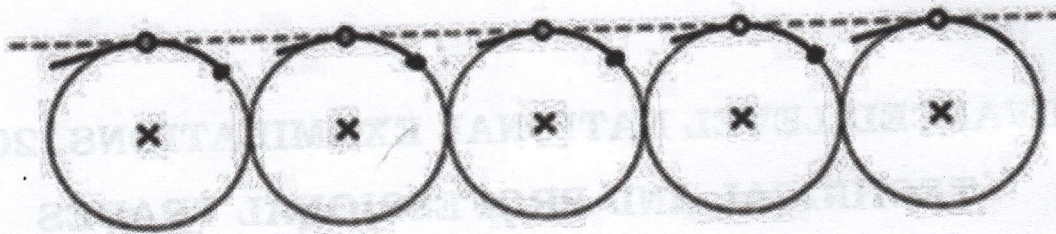
Section III: Three (3) questions, **Choose only One (1).** **15marks**

Every candidate is required to strictly obey the above instructions. Punishment measures will be applied to anyone who ignores these instructions.

Section I. Fifteen (15) Compulsory questions. 55marks

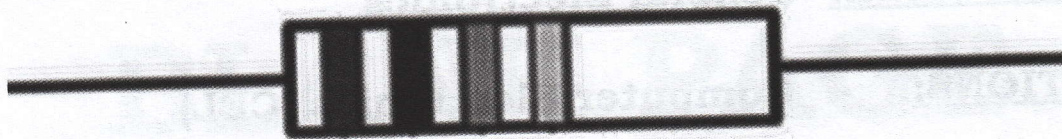
01. What is electricity? 2marks
 02. What is the difference between conductors and insulators? 2marks
 03. Define doping process? 2marks
 04. Show the direction of electron and hole from the figure below. 2marks

- Electro
- Hole
- × Nucleus



05. Give the value of resistor for the figure below, using color code.

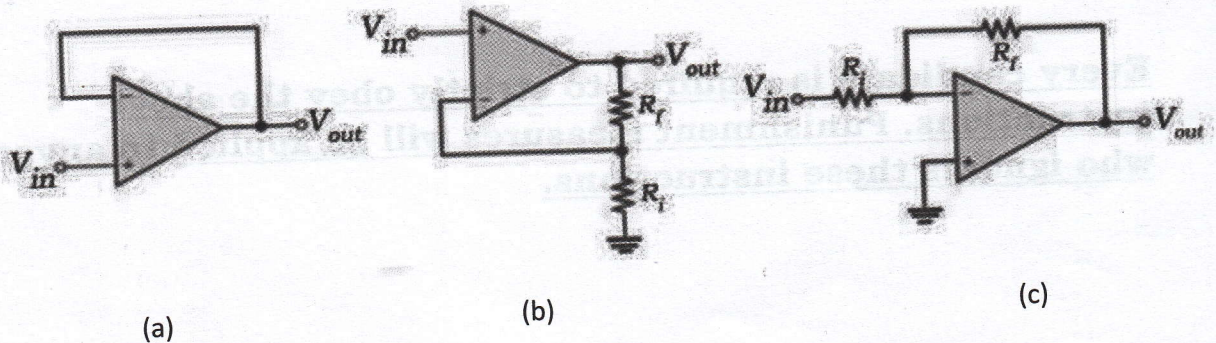
Brown, black, red, silver



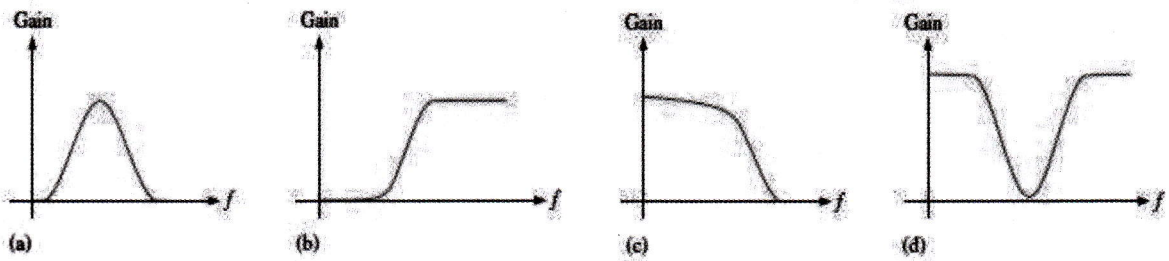
06. Refer to the given formula, give the four factors affecting resistor. 2marks
4marks

$$R = \rho \frac{\ell}{A} \text{ ohm}$$

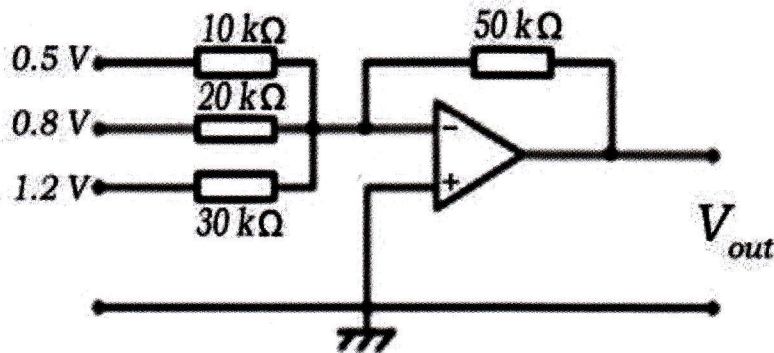
07. From the given binary number 01101011 show the MSB and the LSB. 4marks
 08. Convert the decimal number 1993 into octal number. 5marks
 09. Convert binary number 1011.101_2 to decimal number. 4marks
 10. Identify each of the op-amp configurations in figure (a), (b), (c). 3marks



11. Identify each type of filter response (low-pass, high-pass, band-pass, or band-stop filter) in figure (a),(b),(c),(d) **6marks**

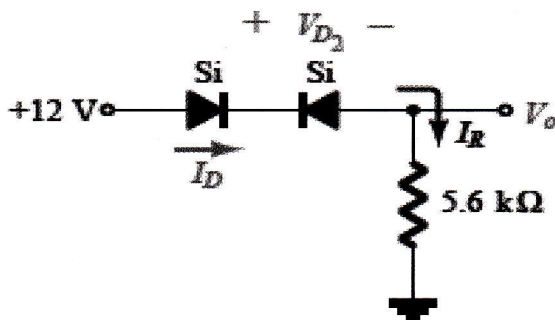


12. For the summing op amp shown in figure below, determine the output voltage, V_o .



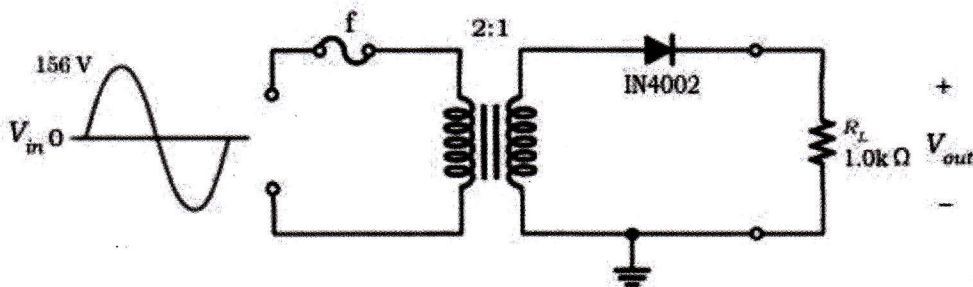
4marks

13. Determine I_D , V_{D2} , and V_o for the circuit of figure below.



6marks

14. Determine the peak value of the output voltage for the circuit of the following figure



6marks

15. Light Emitting Diodes are made from compound type semiconductor materials such as.....

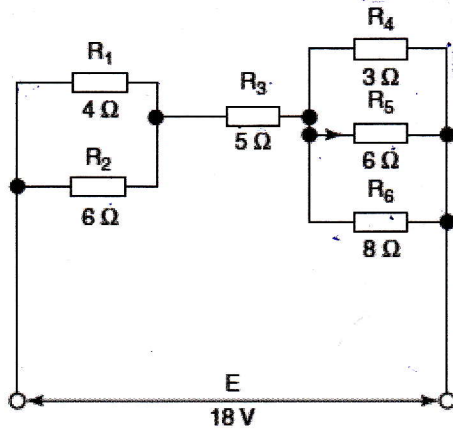
3marks

Section II. Answer any three (3) questions of your choice

(Do not choose more than three questions). 30marks

16. For the circuit of Figure shown below calculate:

- (i) The current drawn from the source,
- (ii) The p.d.(potential difference) across each resistor.

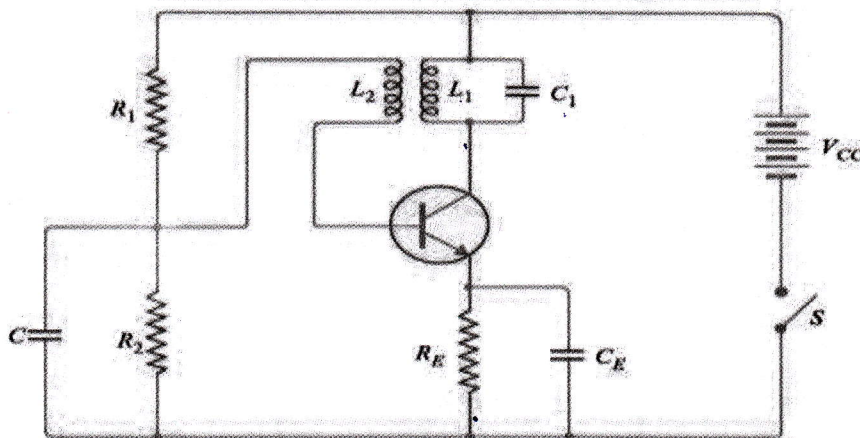


10marks

17. A $3 \mu\text{F}$ capacitor is charged from a 250 V d.c. supply. Calculate the charge and energy stored. The charged capacitor is now removed from the supply and connected across an uncharged $6 \mu\text{F}$ capacitor. Calculate the p.d. between the plates and the energy now stored by the combination.

10marks

18. Give the name and briefly explain the working operation of the circuit below.

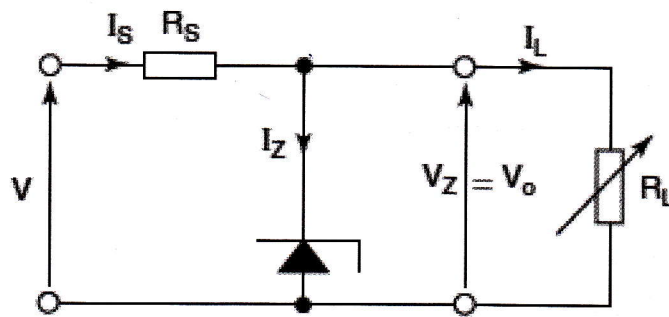


10marks

19. The figure below shows a 9.1 V, 500 mW zener diode which is used to supply a $2.5 \text{ k}\Omega$ load. The diode has a slope resistance of 1.5Ω , and the input supply has a nominal value of 12 V.

- (a) Calculate a suitable value for the series resistor R_s .
- (b) Calculate the value of diode current when the load resistor is connected to the circuit.

- (c) If the input supply voltage decreases by 10%, calculate the percentage change in the p.d. across the load.



10marks

20. a. Show Main parts of cathode ray tube on neat sketch.
 b. The deflection sensitivity of a CRT is 0.03 mm/V. If an unknown voltage is applied to the horizontal plates, the spot shifts 3 mm horizontally. Find the value of unknown voltage.

10marks

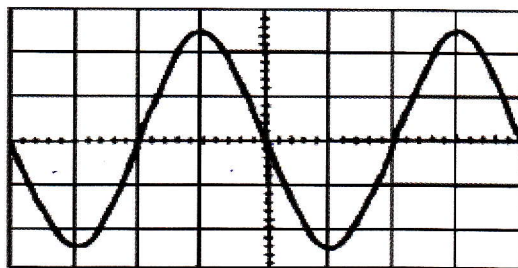
Section III. Answer any one (1) question of your choice

(Do not choose more than one question).

15marks

21. a) Describe how a simple CRO is adjusted to give
 i) a spot trace,
 ii) a continuous horizontal trace on the screen, explaining the functions of the various controls.
 b) A sinusoidal voltage trace displayed by a CRO is shown in Figure below. If the 'time/cm' switch is on 500 $\mu\text{s}/\text{cm}$ and the 'volts/cm' switch is on 5 V/cm, find, for the waveform,
 i) the frequency,
 ii) the peak-to-peak voltage,
 iii) the amplitude,
 iv) the r.m.s. value.

15 marks



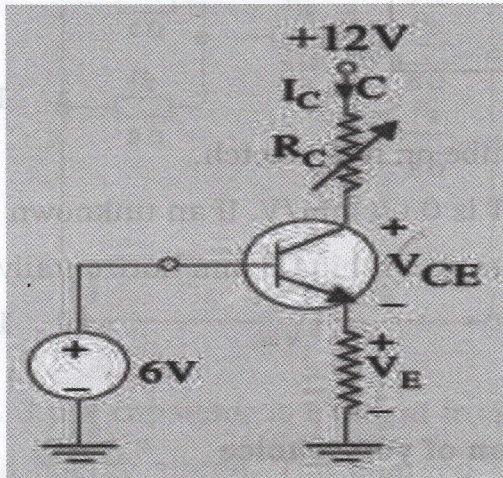
22. A filter section is to have a characteristic impedance at zero frequency of 600 Ω and a cut-off frequency at 5 MHz Design:
 (a) a low-pass T section filter, and
 (b) a low-pass Λ section filter to meet these requirements.

15 marks

23. The circuit of Fig. below is designed to produce nearly constant current through the variable collector load resistance. An ideal 6V source is used to establish the current. Determine:

- (a) Value of I_C and V_E ,
- (b) Range of R_C over which the circuit will function properly.

Assume silicon transistor and values in a, b are large enough to justify the assumptions used.



15 marks