

EASTERN UNIVERSITY, SRI LANKA

SECOND YEAR EXAMINATION IN SCIENCE – 1994/95 & 95/96
(August/September 1997)

PH 202 – ELECTRONICS



Time: 02 hours.

Answer Four questions only.

2. Explain the operation of zener diode.

A regulated power supply is required to supply a current of 150 mA at a voltage of about 5 V. A 250 mW, 5.1 V zener diode is available. The unregulated source to be used is a battery having an open circuit voltage of 12 V, and an output resistance of 5 Ω .

- (a) Making suitable assumptions, find a suitable value of R_s .
- (b) What are the maximum and minimum currents that can be supplied? What happens at the limiting currents?
- (c) What voltage will be measured at the battery terminals when the design current is being drawn?

3. Describe the operation of transistor as an amplifier in Common-Emitter configuration.



Figure shows a modified form of the simple Common-Emitter amplifier, where the base bias is supplied from the collector instead of the positive power supply terminal. The transistor has $\beta = 100$, and it is required to set the operating point such that $V_{ce} = 6$ volt, and $I_c = 1$ mA.

1. Explain the mechanism of current flow in

- (a) *N*-type semi-conductor
- (b) *P*-type semi-conductor

State what do you understand by barrier potential across a *P-N* junction.

A crystal diode having a forward resistance of 100Ω is used as half wave rectifier. Find the *r.m.s.* value of voltage fed to it so as to act 100 V of d.c. across the load resistance of 2000Ω .

In what respect is an LED different from an ordinary *P-N* junction diode?

2. Explain the operation of zener diode.

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- (a) Making suitable assumptions, find a suitable value of R_z .
- (b) What are the maximum and minimum currents that can be supplied? What happens at the limiting currents?
- (c) What voltage will be measured at the battery terminals when the design current is being drawn?

3. Describe the operation of transistor as an amplifier in Common-Emitter configuration.

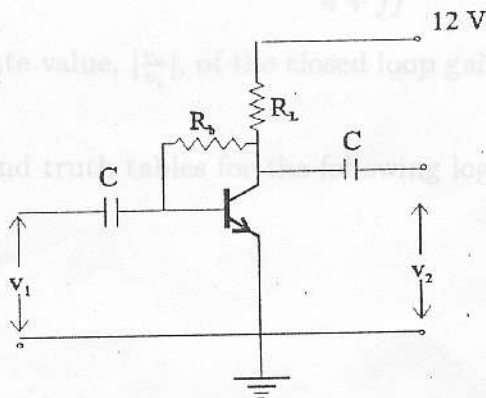
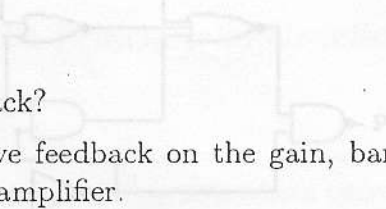


Figure shows a modified form of the simple Common-Emitter amplifier, where the base bias is supplied from the collector instead of the positive power supply terminal. The transistor has $\beta = 100$, and it is required to set the operating point such that $V_{ce} = 6$ volt, and $I_c = 1$ mA.

Write the truth table for the logic circuit below.

- (a) Find the values of R_b and R_L required.
- (b) The transistor is now replaced with another having $\beta = 150$. What is the new operating point? Hence comment on the desirable feature of the biasing configuration.



4. What do you mean by feedback?

Explain the effects of negative feedback on the gain, bandwidth, input impedance and output impedance of an amplifier.

An amplifier has a nominal gain of -500 , distortion 10% and a normal input of 1 volt. If 5% of the output voltage is fed back to input. Calculate

- (a) the gain with feedback,
- (b) distortion with feedback,
- (c) input voltage required to give the same output as without feedback.

5. What characteristics should an ideal operational amplifier possess?

Discuss briefly the difference between a non-inverting amplifier and an inverting amplifier constructed using an operational amplifier.

The operational amplifier in a simple inverting amplifier circuit with input resistance $5\text{ k}\Omega$ and feedback resistance $100\text{ k}\Omega$ has open loop gain at frequency f given by

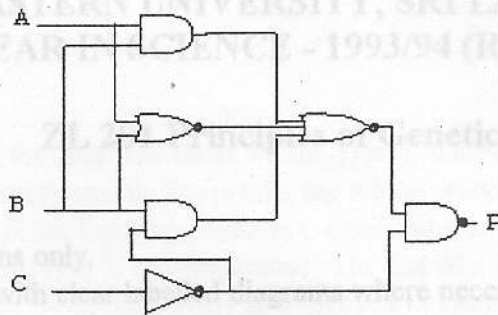
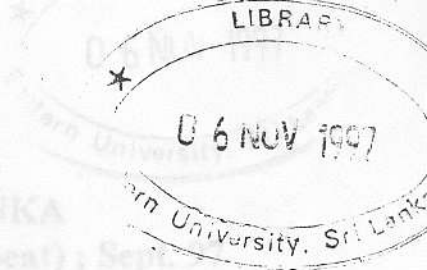
$$A(f) = -\frac{800000}{4 + jf}$$

Calculate the absolute value, $|\frac{v_o}{v_i}|$, of the closed loop gain at $f = 10\text{ kHz}$ and 1 MHz .

6. Draw the symbols and truth tables for the following logic gates.

- (a) AND
- (b) OR
- (c) NAND
- (d) NOR
- (e) exclusive OR

Write the truth table for the logic circuit below.



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Illustrate your answers

In a chemical process, an alarm buzzer sounds (P) if the temperature rises above a specified level (A), the pressure rises above a specified level (B) or the supply of raw materials is not above a specified minimum (C). Write down the truth table and a Boolean expression for the required conditions.

- d) Co-dominance
- e) Sex linkage

02. Explain the following:

- a) Sequencing of DNA molecules
- b) Chromosome aberrations

03. a) What do you understand by the term genetic engineering?

- b) Briefly describe the two major processes that are involved in the formation of a genetically engineered animal.

04. a) What is complementation test?

- b) Briefly explain how you would carry out an experiment to illustrate that there is a complementation between mutations.

05. Comment on the following:

- a) In four-O' clock plants, seeds from red flower plants do not always give red flower petals.
- b) In *Drosophila*, occasionally one half of the animal look like a male and the other half like a female.
- c) Occasionally human male, is "phenotypically a female".
- d) Some human beings cannot differentiate rippen chillies from unripen chillies.

06. a) Phenyl thio carbamide (PTC) tasting is dominant (T) to non tasting (t).

If a taster woman with a non taster father married a taster man, who in a previous marriage had a non taster daughter, what would be the probability that

- i) their first child would be a non taster?
- ii) their first child would be a non taster female?