THE UNITED REPULIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL OF TANZANIA
DIPLOMA IN EDUCATION EXAMINATION

793

ELECTRONICS

Time: 3 Hours **Wednesday, 08th May 2019 a.m.**

Instructions

1. This paper consists of sections A and B with a total of **fifteen (15)** questions.
2. Answer **all** questions in section A and any **three (3)** questions from section B.
3. Section A carries **forty (40)** marks and section B carries **sixty (60)** marks.
4. All writings must be in blue or black ink **except** drawings which must be in pencil.
5. All communication devices and any unauthorized materials are **not** allowed in the examination room.
6. Write your **Examination Number** on every page of your answer booklet(s).

SECTION A (40 Marks)

Answer **all** questions in this section

1. (a) Define the term intrinsic semiconductor and give two examples.

   (b) (i) Give the meaning of term 'potential barrier' of a semiconductor diode.
   (ii) State the threshold voltages for germanium and silicon diodes.

2. If the emitter currentof a transistor is changed by 1mA, its collector current is found to change by 0.995mA. Calculate:
   (a) It'sa.c alpha (α)

   (b) It'sa.c beta (β)

3. (a) How many PN junctions does a BJT has?

   (b) Why an ordinary junction transistor called bipolar transistor?

   (c) What are the two characteristics of a good amplifier?

4. (a) What is meant by integrated circuit as used in electronic systems?

   (b) List three drawbacks of ICs.

5. (a) Name two broad categories of electronic oscillators.

   (b) The resonant circuit of a tuned-collector transistor oscillator has a resonant frequency of 5 MHzIf the value of the capacitance is increased by 50%, calculate the new resonant frequency.

6. (a) (i) Define the term 'feedback' as used in amplifiers.
   (ii) Which type of feedback is frequently used in amplifier circuits?

   (b) The gain of an amplifier without feedback is 90. If a negative feedback is used with the feedback ratio of 0.1, calculate the amplifier gain.

7. A choke coil takes a current of 2A lagging 60° behind the applied voltage of 200V at 50 Hz. Calculate the:
   (a) impedance of the coil

   (b) resistance of the coil.

8. (a) Define a *light emitting diode* with respect to its biasing condition.

   (b) (i) Draw a circuit symbol for a photoconductive cell.

   (ii) State one application of a photoconductive cell.

9. (a) Why switching regulators differ from the linear regulators as far as the control element is considered?

(b) What are the three basic types of switching regulators?

10. (a) State one disadvantage of unregulated power supply.

(b) Draw a well labeled typical dc power supply block diagram.

SECTION B (60 Marks)

Answer **three (3)** questions from this section

11. Study Figure 1 and answer the questions that follow. Assume that, $Iz_{(min)}$ = 1mA, $Iz_{(max)}$ = 15mA, Vz = 5.1V and r_z = 10 Ω.

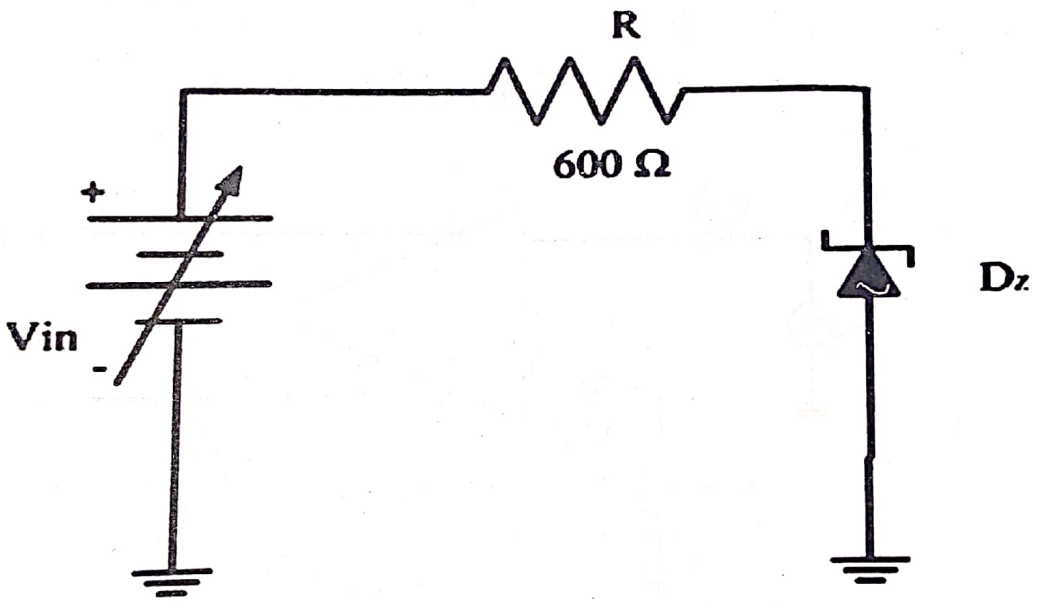

Figure 1

(a) Draw the equivalent circuit of Figure 1 and locate all the given components with their values.

(b) Determine the minimum and maximum input voltages that can be regulated by the zener diode.

(c) (i) What is ripple factor in electronic power supply?

(ii) Mention three types of RLC filters.

12. The differential amplifier shown in Figure 2 has a differential voltage gain of 2500 and a CMRR of 30,000.In Figure 2(a), a single ended input of 500 μA r.m.s is applied and at the same time a 1V, 60 Hz interference signal appears on both inputs as a result of radiated pick-up from the ac power system. In Figure 2(b), differential input signals of 500 μVrms each which are 180° out of phase are applied to the inputs. The common-mode interference in Figure 2 (b) is the same as in Figure 2(a).

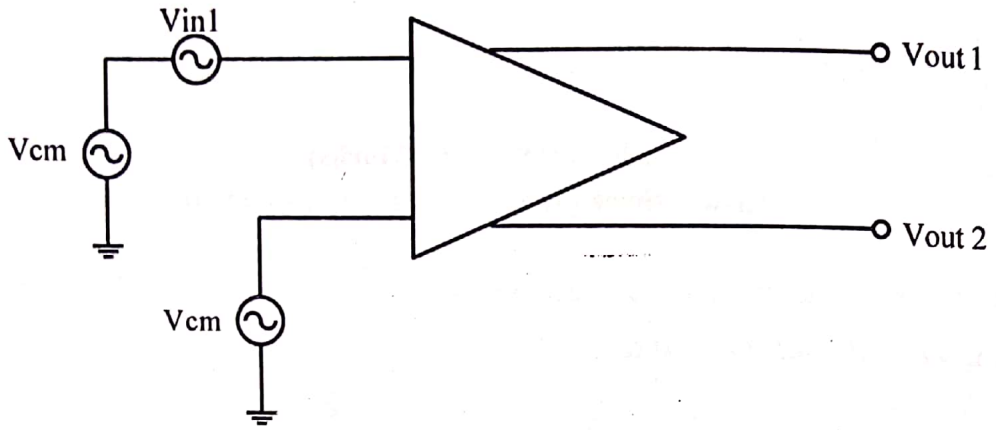

Figure 2 (a)

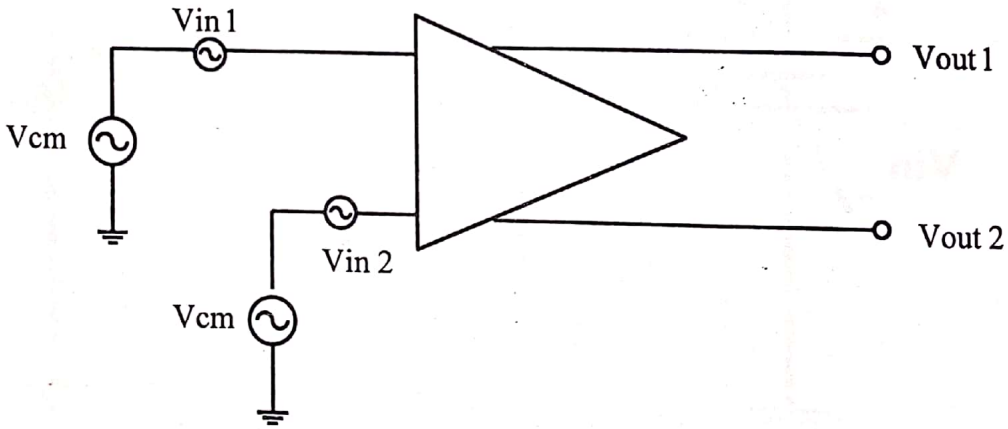

Figure 2 (b)

(a) Determine the overall common-mode gain.

(b) Express the overall CMRR in dB.

(c) Determine the r.m.s output signal for Figure 2(a) and 2(b).

(d) For the results you obtained in 13(c), state the relationship between the output voltage of Figure 2(a) and that of Figure 2(b).

(e) Determine the value of r.m.s interference voltage on the output.

13. (a) With reference to feedback amplifiers, briefly explain the following terms:

(i) Negative feedback.

(ii) Positive feedback.

(b) Draw a well labeled block diagram to represent the general principle of amplifier feedback.

(c) (i) State four advantages and one disadvantage of applying negative feedback on an amplifier.

(ii) Mention four types of negative feedback configuration.

(iii) The open loop voltage gain of an amplifier is 1000. When a negative feedback is applied the voltage gain becomes 40 dB. If the open loop gain increases by 10%, what will be the percentage change in the overall gain with negative feedback?

14. The amplifier circuit shown in Figure 3 is designed to operate with maximum possible output signal. If the amplifier is properly biased and its emitter voltage (V_E) is 3.3 V, calculate the values of:

(a) Maximum transistor power rating.

(b) A.C output power.

(c) Efficiency.

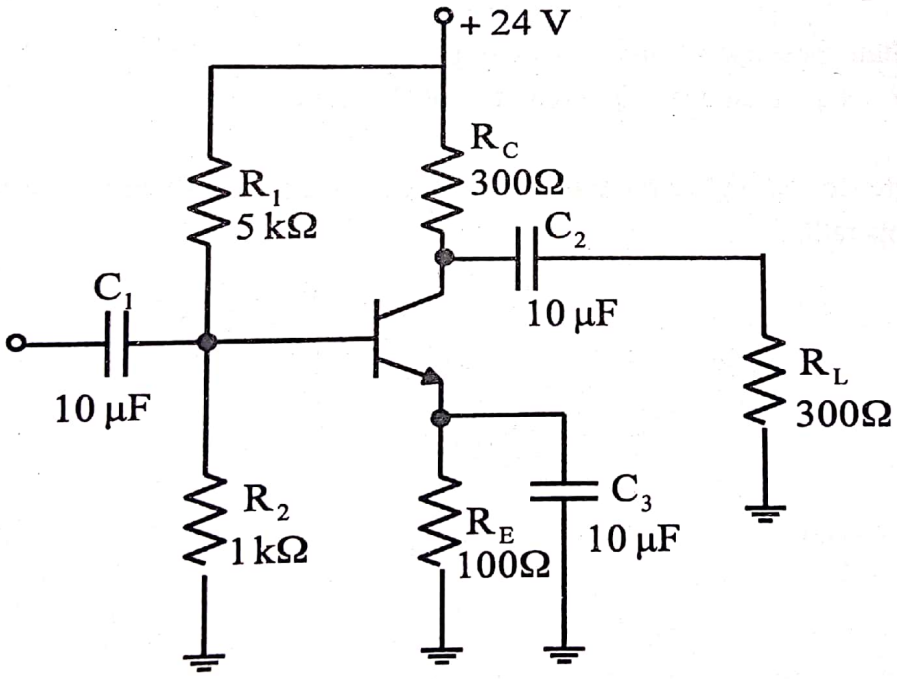

Figure 3

15. (a) (i) Point out two necessary regions in which a transistor is normally operate when used as an electronic switch.

(ii) Study Figure 4(a) and 4(b) then state the condition of each transistor when used as a switch.

(iii) Give a reason for each of the condition you stated in (a) ii.

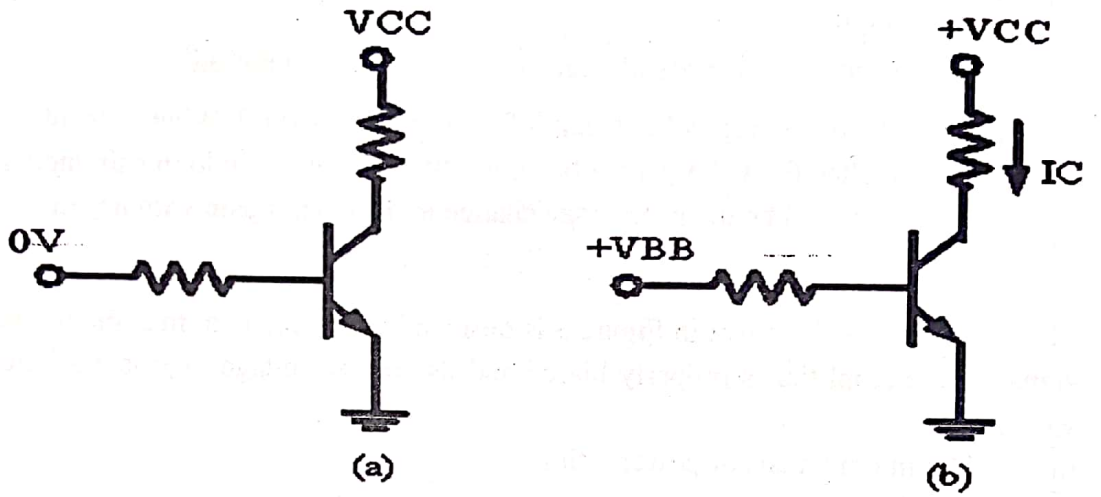

Figure 4

(b) (i) State three applications of Op-Amps

(ii) What are the three chief properties of Op-Amps?

(c) With reference to PNPN structure, construct a two-transistor arrangement to represent the SCR operation.