*Ref. No.: Ex/IEBE/T/311/2019*

# B. INS. & ELEC. ENGINEERING 3RD YEAR 1ST SEMESTER EXAMINATION 2019

## ELECTRONIC CIRCUITS-II

**TIME: 3 HOURS**

**FULL MARKS: 100**

**List of Course Outcomes (CO):**

CO1: Describe and analyze the behavior of multi-stage amplifier circuits (K2, K4, A1)

CO2: Identify and interpret frequency response characteristics of small signal amplifiers (K3, A1-recognize)

CO3: Differentiate and examine feedback circuits of various kinds (K4, A2)

CO4: Classify and explain different types of oscillator and multivibrator circuits (K2, A1)

CO5: Explain and analyze the operation of power amplifiers (K2, K4, A1)

**Instructions to the Examinees:**

- Each module in the question paper matches up with the corresponding CO
- Attempt questions from **ALL** the modules for the attainment of all the COs
- Alternative questions (if any) exist within a module, not across the modules
- Different parts of same question should be answered together

**MODULE 1** *(Answer question no. 1 and any* ***one*** *from the rest)*

1.

(a) What is the effect of early voltage in determining one of the parameters of BJT?

(b) What is the use of bypassed emitter resistor for a transistor amplifier?

(c) Draw one amplifier circuit for which voltage gain remains insensitive to the temperature of the ambience. Explain.

(d) A common base amplifier with voltage gain of 150 is supplied with a 5mV signal with a non-zero source resistance. Find out the output voltage.

(e) Two common emitter amplifiers are connected in cascade. What would happen if one common collector stage is inserted between them?

3X5=15

2. Draw the circuit diagram of a cascode amplifier. Hence, find out the overall voltage gain of such an amplifier.

15

3. Show that the small-signal voltage and current gain of a common-collector amplifier is given by:

$$A_v = \frac{(1+\beta)(r_o \parallel R_E)}{r_\pi + (1+\beta)(r_o \parallel R_E)} \cdot \left(\frac{R_i}{R_i + R_s}\right)$$

$$A_i = (1+\beta)\frac{(R_1 \parallel R_2)}{(R_1 \parallel R_2 + R_{ib})} \cdot \left(\frac{r_o}{r_o + R_E}\right)$$

where the symbols have their own significances.

15

**MODULE 2** *(Answer any* ***one*** *question)*

4. For the amplifier circuit in Fig. 1, find out the mid-band voltage gain and lower cut-off frequency. Assume $c_\pi = 20\ pF, c_\mu = 2.4\ pF$.

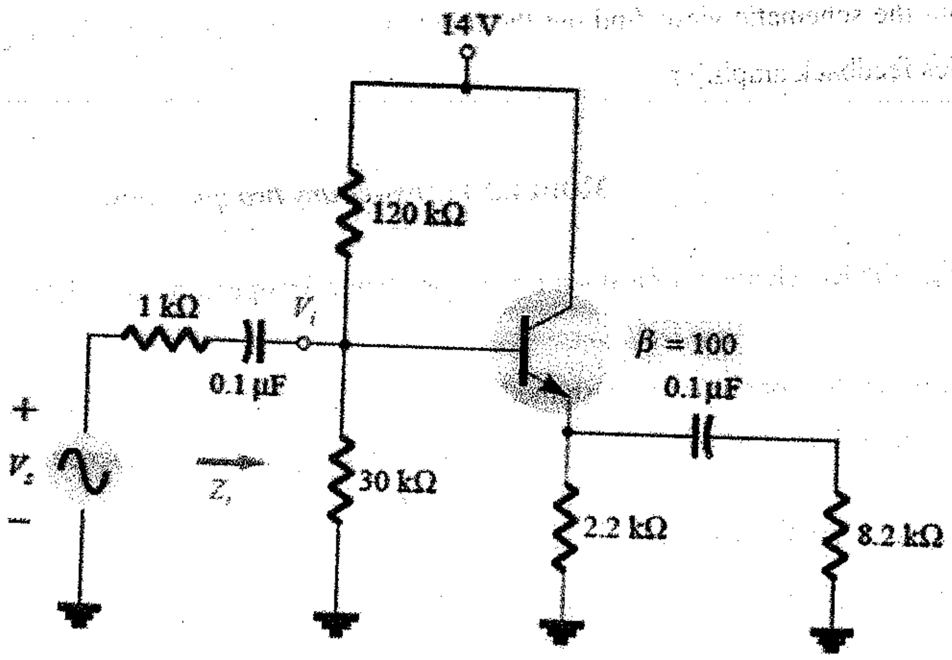


Fig. 1

5. 15

(a) Illustrate the effect of emitter bypass capacitor on the amplifier gain. Find out the expression for gain and identify the two corner frequencies.

(b) Why is the value for bypass capacitor generally chosen to be higher as compared to coupling capacitor?

10+5

**MODULE 3** *(Answer any* ***two*** *questions)*

6.

(a) Consider a feedback amplifier with an open-loop low-frequency gain of $A_0 = 10^4$, an open-loop band-width of $\omega_H = 200\pi\ rad/sec$, and a closed-loop low-frequency gain of $A_f(0) = 50$. Determine the bandwidth of the feedback amplifier. Derive the necessary equation for your calculation.

(b) What do you understand by desensitivity factor? Why it is called so?

6+4

7. Draw and explain the operation of an amplifier circuit using a single BJT which exhibits voltage-series feedback. Find out the expression for voltage gain with feedback.

10

8. From the schematic view, find out the input and output impedance of voltage-shunt and current-series feedback amplifier.

10

## MODULE 4 *(Answer any two questions)*

9. Design the RC elements of a Wien Bridge oscillator for operation at 10 KHz.

10

10. Determine the condition for sustained oscillation of an LC oscillator. Realize Hartley oscillator using amplifier and discrete components and hence find out the frequency of oscillation.

11. Write short notes on: 10

(a) Barkhausen condition for sustained oscillation

(b) Astable multivibrator

2X5=10

## MODULE 5

12. Determine the voltage gain and power gain of the class A power amplifier in Fig. 2. Assume $\beta = 200$ for all transistors.

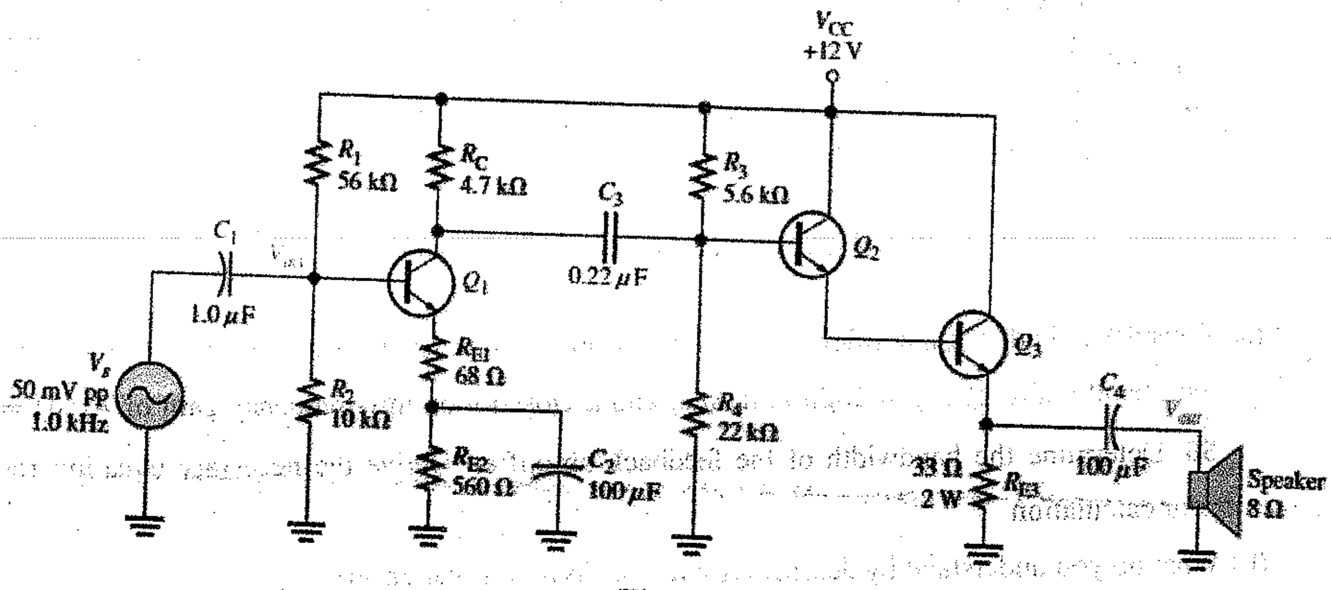


Fig. 2

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