

R16

Code No: 133AB

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, November/December - 2018

ANALOG ELECTRONICS

(Common to ECE, ETM)

Time: 3 Hours

Max. Marks: 75

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit.

Each question carries 10 marks and may have a, b, c as sub questions.

PART- A

(25 Marks)

- 1.a) What are the types of distortion in amplifiers. [2]
- b) Classify the amplifiers according to the method of coupling. [3]
- c) Why the h parameter model is not suitable to analyze transistor at high frequencies. [2]
- d) What are the elements in the Hybrid 'II' model? [3]
- e) What is cascode amplifier? [2]
- f) State the advantages and disadvantages of the source follower. [3]
- g) What is meant by positive and negative feedback? [2]
- h) State the Barkhausen criterion for oscillations. [3]
- i) What are the requirements of a tuned amplifier? [2]
- j) Give the definition of power amplifier. Also list the types in it based on location of Q point. [3]

PART-B

(50 Marks)

2. Draw the h-parameter equivalent circuit for a typical common emitter amplifier and derive expression for A_i , A_v , R_i and R_o [10]

OR

3. Draw simplified h parameter equivalent circuit and calculate A_i , A_v , A_{v_s} , R_i and R_o for the cascode circuit shown in figure 1. Assume that transistors are identical with $h_{fe}=10$, $h_{ie}=2\text{ K}\Omega$, $h_{re}=h_{oe}=0$. [10]

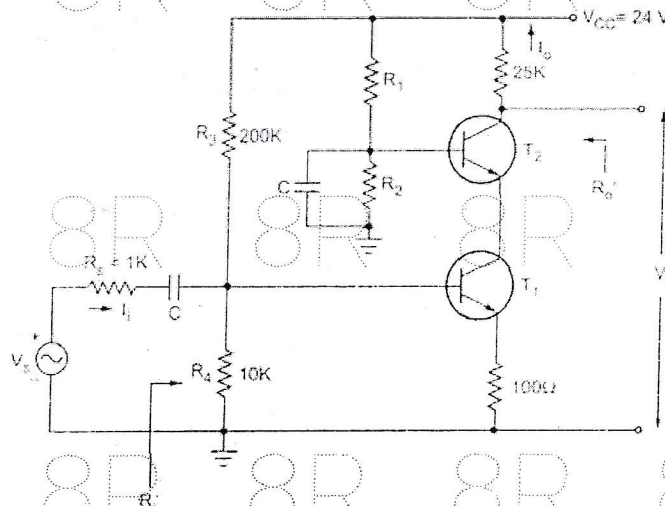


Figure: 1

- 4.a) Derive an expression for current gain with resistive load.
 b) The hybrid- Π parameters of the transistor used in the circuit shown in figure 2 are $g_m = 50 \text{ mA/V}$, $r_{b'e} = 1 \text{ K}\Omega$, $r_{b'c} = 4 \text{ M}\Omega$, $r_{ce} = 80 \text{ K}\Omega$, $C_c = 3 \text{ pF}$, $C_e = 100 \text{ pF}$ and $r_{bb} = 100 \Omega$, find (i) upper 3 dB frequency of current gain (ii) the Magnitude of voltage gain at $A_{vs} = V_0/V_s$ at frequency of part (i) [5+5]

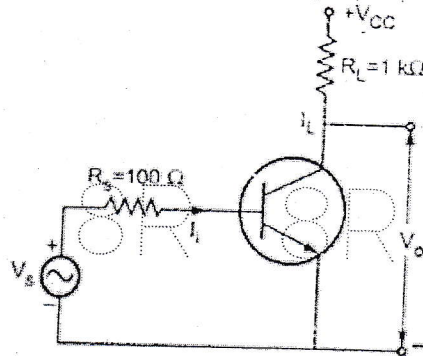


Figure: 2
OR

- 5.a) A single stage CE amplifier is measured to have a voltage gain bandwidth f_H of 5 MHz with $R_L = 500 \Omega$. Assume $h_{fe} = 100$, $g_m = 100 \text{ mA/V}$, $r_{bb} = 100 \Omega$, $C_c = 1 \text{ pF}$ and $f_T = 400 \text{ MHz}$. (i) find the value of source resistance that will give the required bandwidth. (ii) with the value of R_s found in (i), find the mid band voltage gain V_0/V_s .
 b) In hybrid 'pi' model of a transistor at high frequencies, show that the g_m is proportional to the collector current. [5+5]

- 6.a) Discuss the input and output characteristics of a folded cascade amplifier with NMOS input.
 b) Derive expression for A_v and R_o for common gate amplifier. [5+5]

OR

- 7.a) Draw and explain the CS stage with diode connected load.
 b) Discuss the MOSFET characteristics in depletion mode. [5+5]

- 8.a) Show that for a current series feedback amplifier the input and output resistances are increased by a factor of $(1+A\beta)$ with feedback.
 b) Identify the topology of feedback in the circuit of figure 3 giving Justification. Two transistors are identical with $h_{ie} = 2 \text{ K}$ and $h_{fe} = 100$. Calculate i) R_{if} (ii) A_{if} (iii) A_{vf} [5+5]

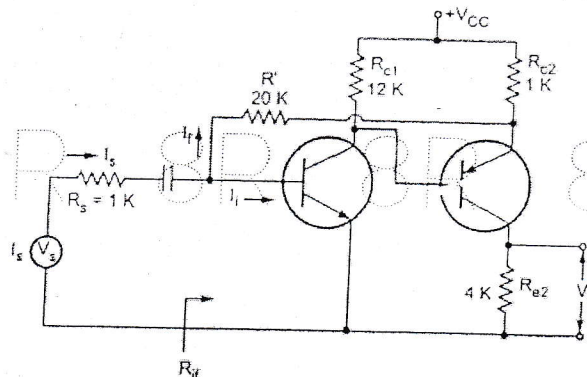


Figure: 3
OR

- 9.a) Explain the principle of operation of the wein bridge oscillator.
b) Mention the features and advantages of the crystal oscillator. [5+5]

- 10.a) Show that the transformer coupled class A amplifier maximum efficiency is 50%.
b) Compare the push-pull class B and complementary symmetry class B amplifier. [5+5]

OR

- 11.a) A tuned amplifier is required to have a voltage gain of 30 at 10.7 MHz with 200 KHz BW. An FET with $g_m=5 \text{ mA/V}$ and $r_d=100 \text{ K}\Omega$ is available. Calculate the values of tank circuit elements.
b) Draw and explain the frequency response of tuned amplifier. [5+5]

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