Code No: 133AB

**R16**

**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 'Π' 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 $A_i$, $A_v$, $A_{vs}$, $R_i'$ and $R_o'$ for the cascode circuit shown in figure 1. Assume that transistors are identical with $h_{fe}$=10, $h_{ie}$=2 KΩ, $h_{re}$=$h_{oe}$=0. [10]

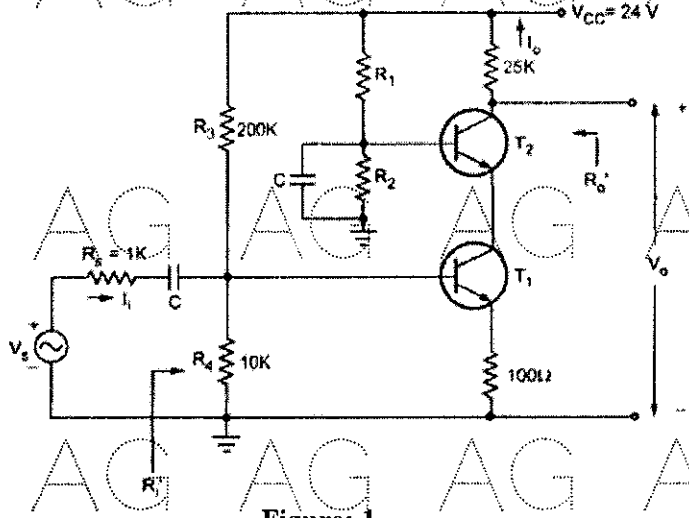


**Figure: 1**

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 mA/V,$r_{b'e}$=1 KΩ, $r_{b'c}$=4 MΩ , $r_{ce}$=80 KΩ, $C_c$=3 pF, $C_e$=100 pF and $r_{bb}$=100 Ω, 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]

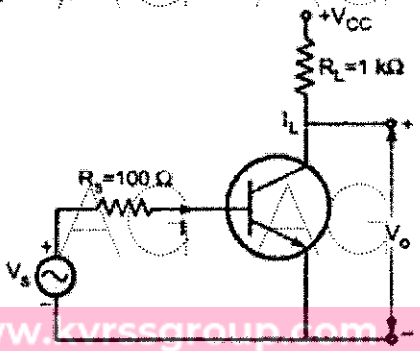


**Figure: 2**

**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 Ω. Assume $h_{fe}$=100, $g_m$=100 mA/V, $r_{bb'}$=100Ω, $C_C$=1pF and $f_T$=400 MHz. (i) find the value of source resistance that will give the required bandwidth. (ii) with the value of Rs 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 if (1+Aβ) with feedback.

b) Identify the topology of feedback in the circuit of figure 3 giving Justification. Two transistors are identical with $h_{ie}$=2 K and $h_{fe}$=100. Calculate i)$R_{if}$ (ii) $A_{if}$ (iii)$A_{vf}$ [5+5]

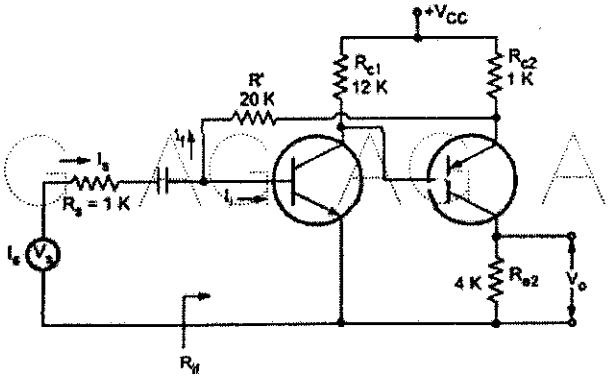


**Figure: 3**

**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 mA/V and $r_d$=100 KΩ 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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