

R16

Code No: 133AB

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, April/May - 2018

ANALOG ELECTRONICS

(Electronics and Communication Engineering)

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) Write the characteristic of CE amplifier. [2]
- b) Discuss the need of Darlington pair circuit. [3]
- c) What is meant by gain bandwidth product? [2]
- d) Short circuit CE current gain of a transistor is 25 at a frequency of 2 MHz, if  $f_{\beta}=200$  kHz calculate  $f_T$ ,  $h_{fe}$  and  $|A_i|$  at frequency of 10 MHz and 100 MHz. [3]
- e) State the advantages and disadvantages of cascode stage. [2]
- f) What is the folded cascode amplifier? Discuss. [3]
- g) Classify the various negative feedback amplifiers. [2]
- h) For a phase shift oscillator, the feedback network uses  $R=6$  K $\Omega$  and  $C=1500$  pF. The transistorized amplifier used, has a collector resistance of 18 K $\Omega$ . Calculate the frequency of oscillation and minimum value of  $h_{fe}$  of the transistor. [3]
- i) What is the use of the heat sink in power amplifiers? [2]
- j) What is meant by loaded and unloaded Q. [3]

PART-B

(50 Marks)

- 2.a) Discuss the low frequency response of BJT amplifier and the effect of coupling and bypass capacitors.
- b) Explain the different coupling schemes used in amplifiers. [5+5]

OR

3. For a two stage amplifier shown in figure 1 calculate (a)  $A_v$  (b)  $A_{v_s}$ , (c)  $R_i$  (d)  $R_o$ . Neglect the effect of all capacitances, Assume that the both the transistors are identical with following parameters.  $h_{fe}=50$ ,  $h_{ie}=1.1$  K $\Omega$ ,  $h_{re}=2.5 \times 10^{-4}$   $h_{oe}=24 \times 10^{-6}$  A/V. [10]

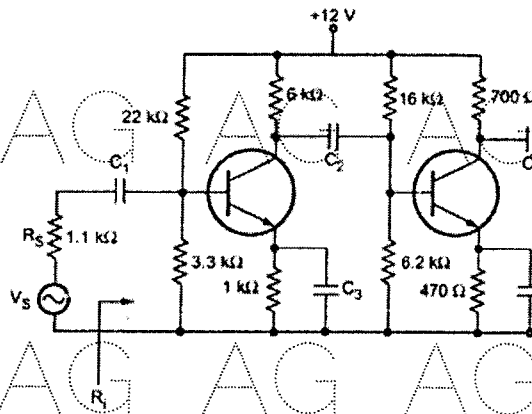


Figure: 1

4.a) For a single stage CE amplifier whose hybrid  $\Pi$  parameters are given below. What value of  $R_s$  will give 3 dB frequency  $f_H$  which is half the value obtained with  $R_s=0$ . Hybrid ' $\Pi$ ' parameters are:  $g_m=50$  mA/V,  $r_{bb'}=100\Omega$ ,  $r_{b'e}=1$  K,  $C_C=3$  pF,  $C_e=100$  pF.

b) A BJT has the following parameters measured at  $I_c=1$  mA,  $h_{ie}=3$  K  $\Omega$ ,  $h_{fe}=100$ ,  $f_T=4$  MHz,  $C_C=2$  pF and  $C_e=18$  pF. Find  $r_{b'e}$ ,  $r_{bb'}$ ,  $g_m$  and  $f_H$  for  $R_L=1$  K $\Omega$ . [5+5]

OR

5.a) Prove that  $h_{fe}=g_m r_{b'e}$ .

b) Derive the expression for CE short circuit current gain  $A_i$  as a function of frequency. [4+6]

6.a) Compare the performance of BJT and FET amplifiers.

b) Draw and explain the CS amplifier with current source load. Derive an expression for  $A_v$ . [5+5]

OR

7.a) Draw and explain the MOS small signal model.

b) Discuss the analysis of CD JFET amplifier. [5+5]

8.a) What are the advantages and disadvantages of negative amplifier in detail?

b) For the given circuit shown in figure 2, calculate  $R_{mf}$ ,  $A_{vf}$  and  $R_{if}$ . The transistors with parameters  $h_{ie}=2$  K,  $h_{fe}=100$ . Neglect  $h_{oe}$  and  $h_{re}$ . [5+5]

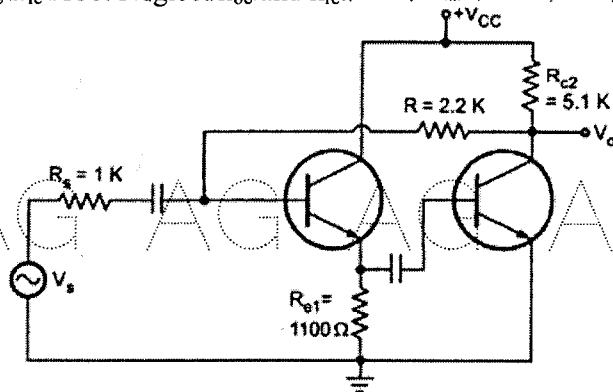


Figure: 2

OR

9.a) In a colpitt's oscillator, the values of the inductors and capacitors in the tank circuit are  $L=40$ mH,  $C_1=100$  pF,  $C_2=500$  pF.

i) Find the frequency of oscillation.

ii) if the output voltage is 10 V, find the feedback voltage.

iii) find the minimum gain, if the frequency is changed by changing 'L' alone.

iv) find the value of  $c_1$ , for a gain of 10.

v) also find the new frequency of oscillation.

b) Compare the RC phase shift and wein bridge oscillators. [5+5]

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10.a) Explain the principle of operation of class C amplifier.

b) Design a class B power amplifier to deliver 25 W to a load resistors  $R_L=8 \Omega$  using transformer coupling,  $V_m=V_{CC}=25$  V. Assume reasonable data where ever necessary.

AG AG AG AG OR AG AG AG [5+5] A

11.a) An RF tuned voltage amplifier using FET with  $r_d=100 \text{ K}\Omega$  and  $g_m=500\mu\text{s}$  has tuned circuit, consisting of  $L=2.5\text{mH}$  and  $C=200 \text{ pF}$  as its load. At its resonant frequency, the circuit offers an equivalent shunt resistance of  $100 \text{ K}\Omega$ . For the amplifier, determine the (i) the resonant gain (ii) the effective Q and (iii) the bandwidth.

b) Draw and explain the double tuned amplifier with the help of the frequency response.

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