

R16

Code No: 133AB

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech II Year I Semester Examinations, February -2024

ANALOG ELECTRONICS

(Electronics and Communication Engineering)

Time: 3 Hours

Max. Marks: 75

- Note:** i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A**(25 Marks)**

- 1.a) Write about the causes of distortion in amplifiers. [2]
- b) What is the principle of Darlington transistor? When it is preferred? [3]
- c) Why the h parameter model is not suitable to analyze transistor at high frequencies? [2]
- d) Define f_{β} and f_T . [3]
- e) State the advantages and disadvantages of the source follower. [2]
- f) Define JFET parameters and mention its relation. [3]
- g) What are the factors that affect the frequency stability of an oscillator? [2]
- h) An amplifier has a midband gain of 125 and a bandwidth of 250KHz. If 4% negative feedback is introduced, find the new bandwidth and gain. [3]
- i) What is Harmonic distortion? [2]
- j) What are the different kinds of power amplifiers? [3]

PART – B**(50 Marks)**

- 2.a) A CB transistor amplifier uses voltage source of internal resistance $R_S = 200 \Omega$ and the load resistance is $R_L = 1200 \Omega$. The h-parameters are $h_{ib} = 24 \Omega$, $h_{rb} = 4 \times 10^{-4}$, $h_{fb} = -0.98$ and $h_{ob} = 0.6 \mu A/V$. Calculate the R_i , A_i , A_v and output admittance. [5+5]
- b) Draw the circuit of two stage R-C coupled CE transistor amplifier and explain the working of it. [5+5]

OR

- 3.a) Describe the need for coupling and bypass capacitors in transistor circuits. Also, draw AC equivalent circuit of CE amplifier. [4+6]
- b) Draw the circuit for CASCODE amplifier and then explain its working. Also, obtain overall values of the circuit in terms of h-parameters. [4+6]

4. Derive the expression for the CE short circuit current gain A_i as a function of frequency using Hybrid - π model. [10]

OR

- 5.a) A single stage CE amplifier is measured to have a voltage gain bandwidth 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 . [6+4]
- b) In hybrid 'pi' model of a transistor at high frequencies, show that the g_m is proportional to the collector currents.

- 6.a) The data sheet of N channel JFET gives the following details. $I_{DSS}=10\text{mA}$ and pinch off voltage of -4.8V . Determine (i) V_{GS} corresponding to drain current of 3.5 mA .
(ii) Determine transconductance g_m at this drain current.
- b) Draw and explain the CS stage with diode connected load. [5+5]

OR

- 7.a) With the help of a diagram explain the operation of an n-channel enhancement MOSFET.
b) Discuss the input and output characteristics of a folded cascode amplifier with NMOS input. [5+5]

- 8.a) Derive the expressions for input and output resistances of a current series feedback amplifier.
b) In a transistorized Hartley oscillator, the two inductances are 2mH and $20\mu\text{H}$ while the frequency is to be changed from 950KHz to 2050KHz . Calculate the range over which the capacitor is to be varied. [5+5]

OR

9. Derive the expression for frequency of oscillations and condition for sustaining oscillations of Wein bridge oscillators with BJT. [10]

- 10.a) Derive the expression for conversion efficiency of Class B push pull power amplifier.
b) Draw the circuit of single tuned capacitance coupled amplifier and explain its operation. [5+5]

OR

- 11.a) Draw the circuit of Direct coupled class-A power amplifier and explain its operation.
b) Define a Q-factor of a resonant circuit. What is the need for tuned amplifiers? [6+4]

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