Code No: 153AT

R18

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech II Year I Semester Examinations, December - 2019
ELECTRONIC DEVICES AND CIRCUITS
(Common to ECE, EIE, MCT)

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 as sub questions.

PART – A

(25 Marks)

1.a) Define Diffusion capacitance.   [2]
  b) Why Biasing is needed in transistor?   [2]
  c) What is pinch off voltage?   [2]
  d) Draw the Ebers model of CE transistor amplifier.   [2]
  e) Draw the characteristics of MOSFET in enhancement mode.   [2]
  f) Which circuit is used as a comparator? Draw its circuit diagram.   [3]
  g) Write all transistor current components for forward biased emitter and reversed biased
     junctions.   [3]
  h) What are the advantages of FET compared to transistor?   [3]
  i) What are the effects of bypass capacitor in an amplifier?   [3]
  j) Compare the performance of MOSFET in depletion and enhancement modes.   [3]

PART – B

(50 Marks)

2.a) Explain how the capacitor filter used to reduce the ripple of full wave rectifier.
  b) Draw the piecewise linear diode characteristics and derive its resistances.   [5+5]

OR

3.a) A 100V peak square wave with an average value of 0V and period of 20ms is to be
     negatively clamped at 25V. Draw the circuit diagram necessary for this purpose. Also,
     draw the input and output waveforms.
  b) Explain the effect of R_f and R_r of a practical semiconductor diode on the transfer
     characteristic of the series diode and parallel diode clipping circuits.   [5+5]

4.   Draw the typical input and output characteristics of common base configuration and
     define all parameters.   [10]

OR

5.a) How I_C of transistor vary with respect to I_{CO}, β and V_{BE}? How diode is used to
     compensate these variations?
  b) How collector to base bias is improve the stability of transistor? Explain with circuit
     diagram.   [5+5]

6.a) For an n channel silicon FET with $a-3 \times 10^{-4}$ cm and $N_D = 10^{15}$ electrons/cm^3, find the pinch-off voltage and the channel half-width for $V_{GS} = 0.5V_P$ and $I_D = 0$.

b) How to bias a field effect transistor for zero drain-current drift? [5+5]

OR

7.a) How zener diode is used for regulation of voltage and compare its performance with semiconductor diode.

b) How the UJT presents negative resistance? Explain with suitable diagram of characteristics. [5+5]

8. The transistor amplifier shown uses a transistor whose h parameters are $h_{ie} = 1.1k$, $h_{re} = 2.5 \times 10^{-4}$, $h_{fe} = 50$, $h_{oe} = 25\mu A/V$ and $R_1 = 2k$. Calculate A_I, A_V, R_i and R_O. [10] (figure 1)
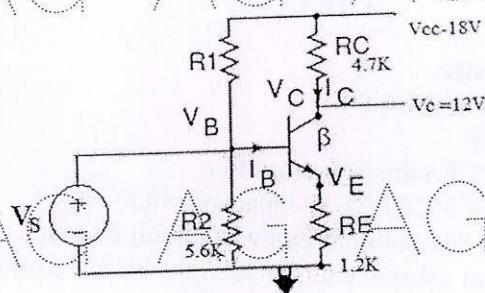

Figure: 1

OR

9.a) Find Common Base h parameters in terms of Common Emitter h parameters.

b) Derive the h parameters from the input and output characteristics of transistor in common collector configurations. [5+5]

10. Prove that the output impedance of the common source amplifier at low frequencies is given by parallel combination of r_d and R_d. [10]

OR

11. A MOSFET has a drain circuit resistance R_d of 2.2k and operates at 20 kHz. Calculate the voltage gain of amplifier shown in figure 2. The MOSFET parameters are $g_m = 1.6mA/V$, $r_d = 44K$, $C_{gs} = 3pF$, $C_{ds} = 3.8pF$ and $C_{gd} = 2.8pF$. Draw its small signal equivalent circuit. [14]
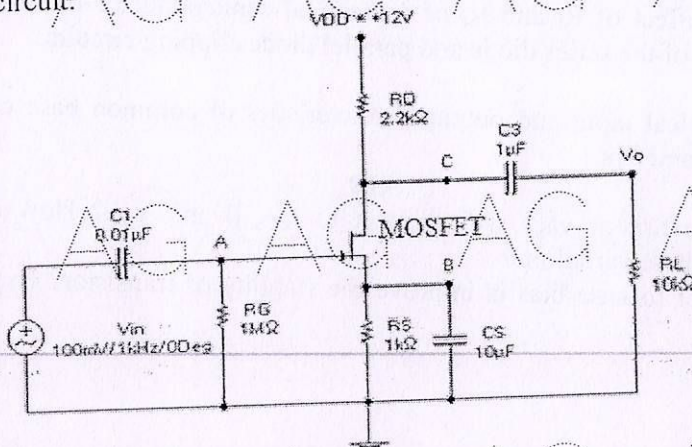

Figure: 2

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