Visvesvaraya National Institute of Technology, Nagpur
Dept. of Electronics and Communication Engineering
Electronic Devices (ECL-201)
B.Tech. Semester III

Slot G: Time 1 Hour
Date: Oct. 11, 2022
Sessional-II Exam
Maximum Marks: 15

Assume any missing data and mention it
All questions are compulsory and carry marks as indicated

Q.1 Why NPN transistors are preferred to PNP transistor? **[CO-1, 0.5 mark]**

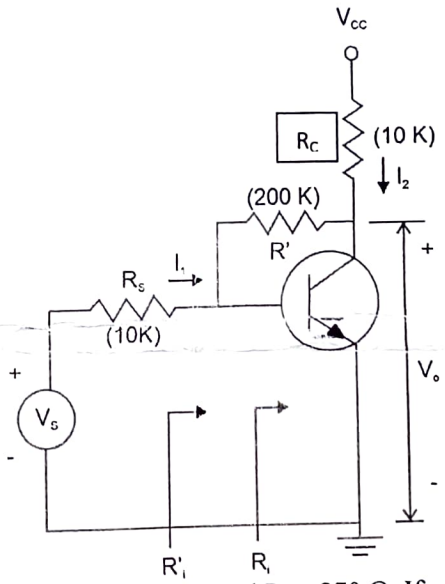
Q.2 Why CE configuration is more popular than CC and CB? **[CO-1, 1 mark]**

Q.3 Which biasing technique is the best and why? **[CO-2, 0.5 mark]**

Q.4 Draw approximate hybrid parameter model. What is necessary condition to use this model? **[CO-2, 1 mark]**

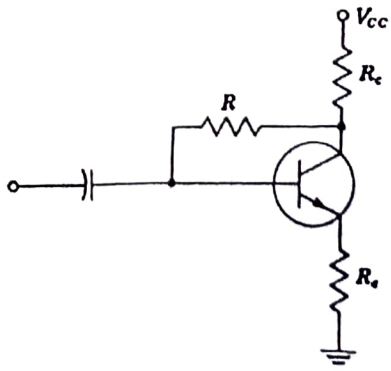
Q.5 Explain the role of coupling capacitor and bypass capacitor in transistor amplifier circuit. **[CO-2, 1 mark]**

Q.6. For the amplifier shown in Fig. Calculate R_i, R'_i, A_v, A_{vs} and $A'_I = -\frac{I_2}{I_1}$ using standard h parameters. **[CO-4, 4 mark]**



$h_{ie} = 1.1\,k\Omega$
$h_{re} = 2.5 \times 10^{-4}$
$h_{fe} = 50$
$h_{oe} = 25\,\mu A/V$

Q.7. In the circuit shown, $V_{CC} = 24$ V, $R_c = 10$ K, and $R_e = 270\ \Omega$. If a silicon transistor is used with $\beta = 45$ and if under quiescent conditions $V_{CE} = 5$ V, determine (a) R, (b) the stability factor S. **[CO-3, 3 mark]**



P.T.O

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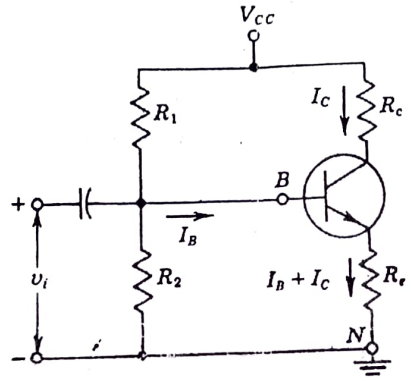
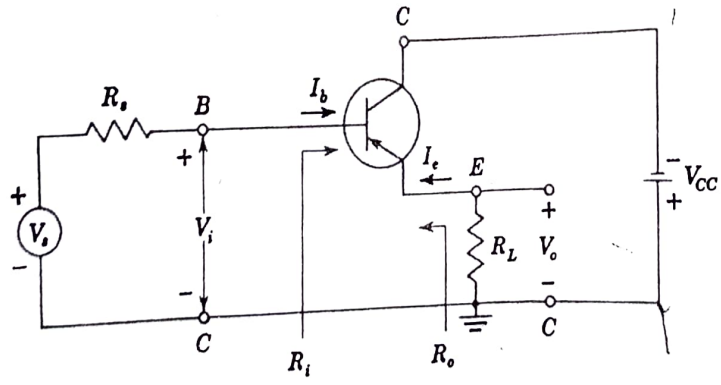
Q.8. Assume that a silicon transistor with $\beta = 50$, $V_{BE,active} = 0.7, V_{CC} = 22.5V$, and $R_c = 5.6$ K is used in Fig. It is desired to establish a Q point at V_{CE} = 12 V, I_c = 1.5 mA, and stability factor S ≤ 3. Find R_e, R_1 and R_2. **[CO-3, 2.5 mark]**



Q.9 For the circuit shown calculate A_I, A_V and Z_i. **[CO-2, 1.5 mark]**
R_s-1K, R_L-5K



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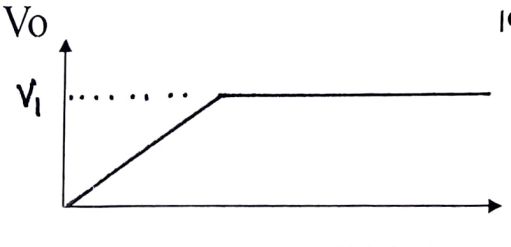
Q.1: Why reverse current is independent of reverse bias voltage? How it varies? **[CO-2, 1 mark]**

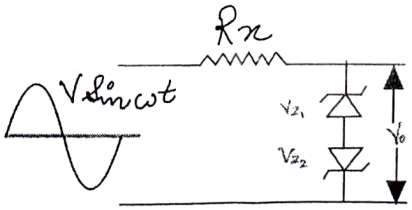
Q.2: Draw Clamper Circuit diagram and its output voltage waveform to show change in the reference voltage. **[CO2, 1 marks]**

Q.3: Waveform shows the transfer characteristics for a particular clipper circuit. Draw the clipper circuit and name it. **[CO2, 2 marks]**

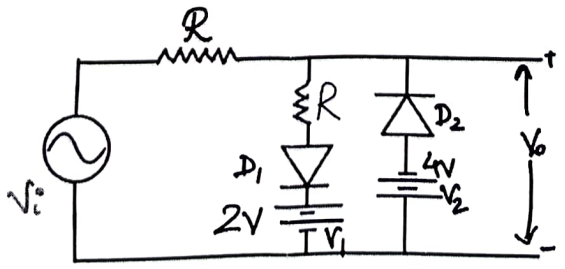


Q.4: Find the conductivity of pure silicon at room temperature. If it is doped with 1 in 10^6 by donor impurity. Find the change in the conductivity. Comment on the result. **[CO3, 2 marks]**

Q.5: Calculate the output voltage and Draw the output waveform if the zener diode Z_1 has the zener breakdown voltage of 3V. and the zener diode Z_2 has breakdown voltage of 4V. The current limiting resistance is 1kΩ and the input signal is 5 $\sin(\omega t)$ **[CO2 and 3]. [2.5 Marks]**



Q.6: Calculate the Output voltage and Draw the output waveform with assumption that diode resistance and voltage drop are zero and the input is waveform is10 $\sin \omega t$. (Value of Resistance "R" is 10kΩ) **[CO2 and 3]. [2.5 Marks]**



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Q.7: A full wave center tap rectifier uses two ideal diodes. The r.m.s value of secondary voltage fed between centre tap to each end of secondary is 48V and the load resistance is 1 kΩ. Find **CO2, 2M**

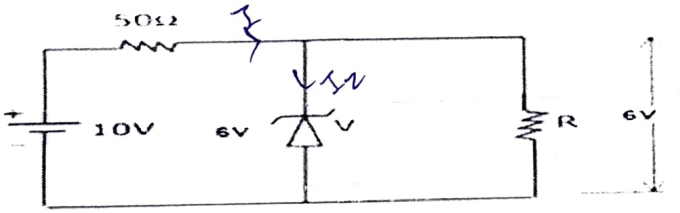
i. DC output voltage.

ii. DC output power.

iii. Rectification efficiency.

iv. Peak inverse voltage.

Q.8: A 6 volts Zener diode shown in figure has zero Zener resistance and a knee current of 5mA. Find the minimum value of R so that the voltage across it does not fall below 6 volts.
CO3 2 marks



BT21 ECE

Visvesvaraya National Institute of Technology, Nagpur
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B.Tech. Semester III

Slot G: Time 3 Hour
Date: Dec. 1, 2022
End Semester Exam
Maximum Marks: 60

Assume any missing data and mention it
All questions are compulsory and carry marks as indicated

Question 1

A. How do you classify power amplifiers? What are the criteria for classification? **(CO1)(2M)**
B. Explain how the active device (Transistor) in a Class A direct coupled resistive load amplifier dissipates less power when a signal is applied than with no signal. **(CO2)(2M)**
C. What modification in Class A push pull amplifier will convert it to Class B push pull? Explain? **(CO2)(1M)**
D. What is the drawback of Class AB amplifier? How to overcome it? **(CO3)(1M)**
E. A power transistor operating in a modified Class A power amplifier delivers a maximum of 5W to a 4Ω load. The quiescent point is adjusted for symmetrical clipping and the collector supply voltage is $V_{CC} = 20V$. Assume ideal characteristics with $V_{min} = 0$. **(CO3 & 4)(4M)**

I. What is the transformer turn ratio $n = N_2/N_1$?
II. What is the peak collector current I_m?
III. What is the quiescent operating point I_C, V_{CE}?
IV. What is the collector circuit efficiency?

Question 2

A. Draw the circuit diagram of Audio frequency oscillator. **(CO2)(2M)**
B. Explain Bark Hausen criteria for the oscillators. **(CO3)(2M)**
C. What is magnitude of **resistance** for Silicon PN junction diode at room temperature and for DC current of 1mA? **(CO3)(2M)**
D. Calculate the anticipated factor by which the **reverse saturation current** of a *Ge* diode is multiplied when the temperature is **increased from 25 to 85°C. (CO5)(1M)**
E. What is **Transformer utilization factor** (TUF)? What is **ideal value** of TUF? What is value of TUF for **Half wave rectifier**? What it implies? **(CO3)(3M)**

Question 3

A. How do you classify feedback amplifiers? **(CO2)(1M)**
B. What is the criterion for classification of feedback amplifiers? **(CO2)(2M)**
C. Discuss advantages of Negative feedback amplifiers. **(CO3)(2M)**
D. An amplifier with open loop voltage gain $A_V = 1000 \pm 100$ is available. It is necessary to have an amplifier whose voltage gain varies by no more than ± 0.1 percent. **(CO3)(2M)**

I. Find the reverse transmission factor β of the feedback network used.
II. Find the gain with feedback.

E. An amplifier with a 1 KΩ input resistance and a 50 KΩ output resistance has a voltage gain of 40. The amplifier is now modified to provide a 10% negative voltage feedback in series with the input. Calculate: **(CO3 & 4)(3M)**

I. The voltage gain with feedback.
II. The input resistance with feedback.
III. The output resistance with feedback.

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Question 4

A. In the transformer coupled amplifier stage shown in **Figure 1**, $V_{BE} = 0.7$ V, $\beta = 50$ and the quiescent voltage is $V_{CE} = 4$V. Determine: **(CO3 & 4) (4M)**

I. *Re*
II. The stability factor *S*

B. For the circuit shown in **Figure 2**, assume $\beta = 100$. **(CO3 & 4)(6M)**

I. Find if the Silicon transistor is in cutoff, saturation or in the active region.
II. Find V_0.
III. Find the minimum value for the emitter resistor R_e for which the transistor operated in the active region.

Question 5

A. Solve. **(CO4)(6M)**

I. The Zener diode regulates at 50 *V* over a range of diode currents from 5 to 40 *mA*. The supply voltage V = 200 *V*. Calculate *R* to allow voltage regulation from a load current $I_L = 0$ up to I_{max}, the maximum possible value of I_L. What is I_{max}?
II. If R is set as in part *(I)* and the load current is set at $I_L = 25$ *mA*, what are the limits between which *V* may vary without loss of regulation in the circuit?

B. The input voltage V_i to the two level clipper shown in **Figure 3** varies linearly from 0 to 150 V. Sketch the output voltage V_0 to the same time scales as the input voltage. Assume ideal diode. **(CO3)(2M)**

C. Show that, the built in voltage developed across the PN junction diode is given by: **(CO2 &CO3)(2M)**

$$V_0 = (KT/q)\, ln(N_A N_D/n_i^2) \text{ Volts}$$

Where, N_A and N_D are acceptor and donor concentrations, and n_i is intrinsic concentration of the material used.

Question 6

A. Draw the circuit diagram of **Full wave bridge rectifier** with **input and output waveforms** and find out expression for I_{RMS} and I_{DC}. **(CO 4 & 5)(4M)**

B. The transistor amplifier shown in **Figure 4** uses transistor with following *h* parameters: $h_{re} = 2.5\text{x}10^{-4}$, $h_{oe} = 1/40$ K, $h_{ie} = 1.1$ K, $h_{fe} = 50$. Calculate A_I, A_V, A_{Vs}, R_O and R_i. . **(CO3 & 4)(6M)**

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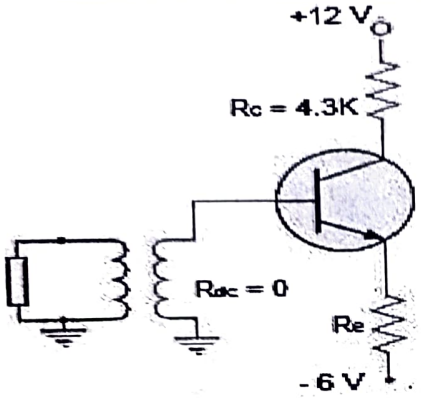

Figure 1

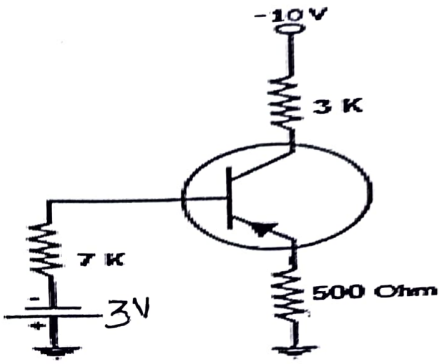

Figure 2

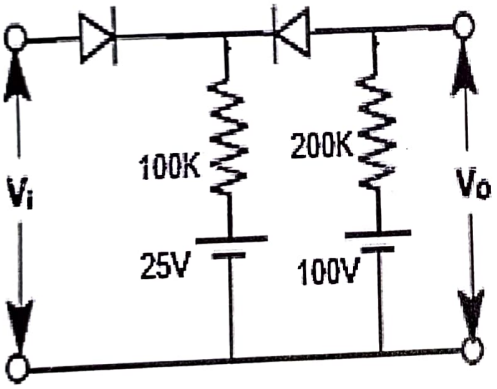

Figure 3

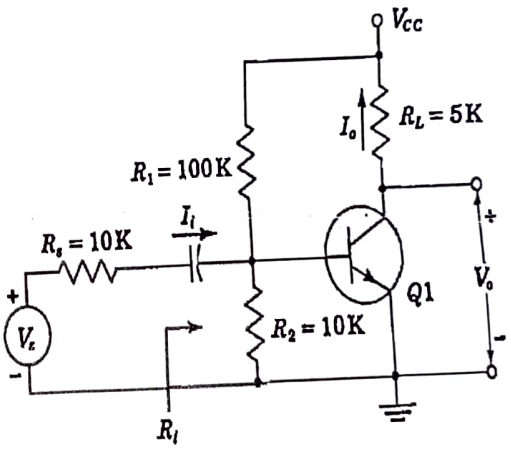

Figure 4

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