Reg. No. : E N G G T R E E . C O M

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B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2024.

Third Semester

Electronics and Communication Engineering



EC 3353 — ELECTRONIC DEVICES AND CIRCUITS

(Common to : Electronics and Telecommunication Engineering)

(Regulations 2021)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)



1. Write the voltage current equation of PN junction diode.

2. Draw the circuit of half wave rectifier.

3. What is an operating point in an amplifier design?

4. Why gain of an amplifier reduces at high frequencies?

5. What is common mode gain?

6. Differentiate single and double tuned amplifier.

7. Define Barkhausen criterion for oscillations.

8. List the advantages of negative feedback.

9. Compare Class A and Class B power amplifier.

10. List the three basic types of DC/DC Converter.

PART B — (5 × 13 = 65 marks)

11. (a) Explain the working of bridge type full of rectifier with neat sinusoidal waveform at the input and sketch the output waveform. Determine the $V_{dc}$ and PIV.

Or

(b) Explain the following characteristics of a silicon BJT transistor in the common emitter configuration.

(i) Collector characteristics (7)

(ii) Base characteristics (6)

12. (a) Derive the voltage gain, input impedance and output impedance for the small signal model of CE Voltage divider configuration. Also mention the phase relation between the input and output.

Or

(b) Derive the voltage gain, input impedance and output impedance for the small signal model of E MOSFET CS – Voltage divider configuration.

13. (a) For the network of Fig. 1



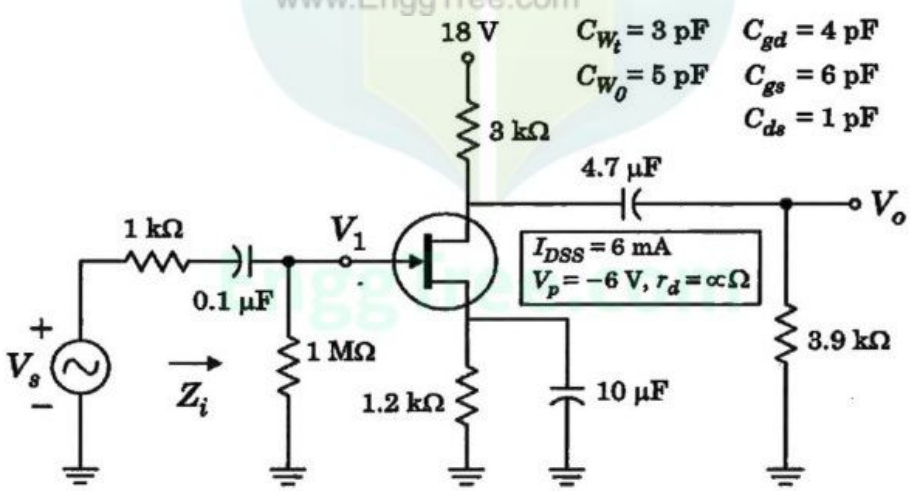


Fig. 1

(i) Determine $g_{m0}$ and $g_m$. (4)

(ii) Find $A_v$ and $A_{vs}$ in the mid-frequency range. (3)

(iii) Determine $f_{Hi}$ and $f_{Ho}$. (3)

(iv) What is the gain-bandwidth product of the amplifier? (3)

Or

(b) For the cascode amplifier of Fig. 2.

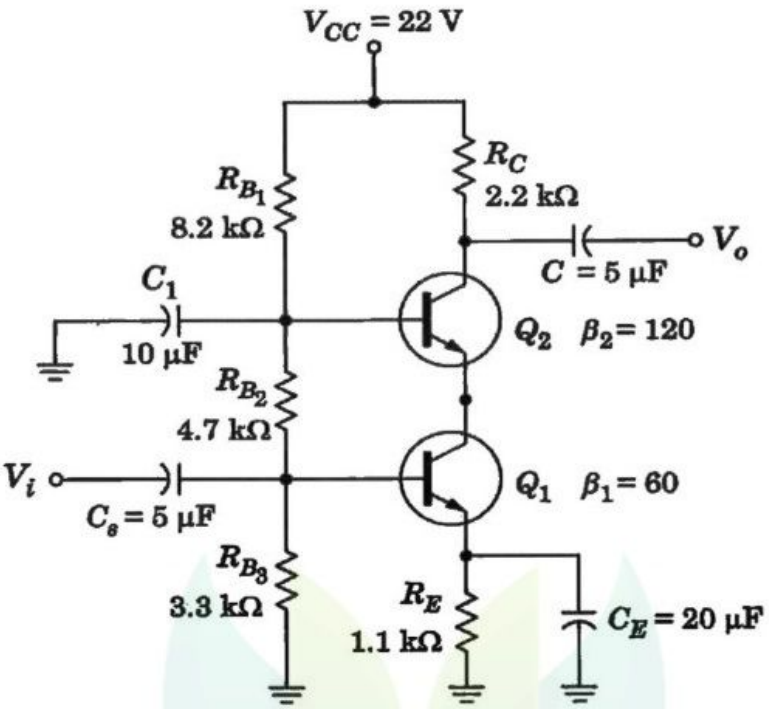


Fig. 2.

Determine

(i) The base and collector currents of each transistor.

(ii) The voltages $V_{B1}$, $V_{B2}$, $V_{E1}$, $V_{C1}$, $V_{E2}$ and $V_{C2}$.

14. (a) Derive the input impedance, output impedance and voltage gain of voltage series feedback network using forward gain block A and feedback gain block $\beta$.

Or

(b) Explain the working of FET Colpitts oscillator. Also derive it frequency of oscillation.

15. (a) Explain the working of series fed class A large signal amplifier using a simple fixed bias circuit and derive the maximum efficiency.

Or

(b) With suitable circuit diagram, elucidate the working of Buck Boost Converter.

PART C — (1 × 15 = 15 marks)

16. (a) (i) Determine $V_L, I_L, I_z$ and $I_R$ for the network in Fig 3 of if $R_L = 180\Omega$. (5)

(ii) Determine $V_L, I_L, I_z$ and $I_R$ for the network of if $R_L = 470\Omega$. (5)

(iii) Determine the value of $R_L$ that will establish maximum power conditions for the Zener diode. (3)

(iv) Determine the minimum value of $R_L$ to ensure that the Zener diode is in the "on" state. (2)

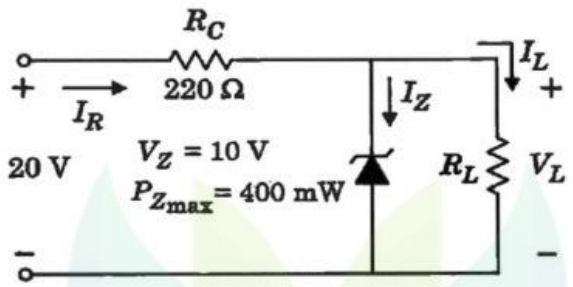


Fig. 3.



Or

(b) A buck boost converter operating at 20 kHz is shown in Fig. 4. The Output capacitor C is sufficiently large to ensure a ripple-free output voltage. The input voltage $V_{in}$ is 15 V. The converter is supplying a load of 10 W. If the output voltage is required to be 10 V, find the duty ratio (D) of the switch.

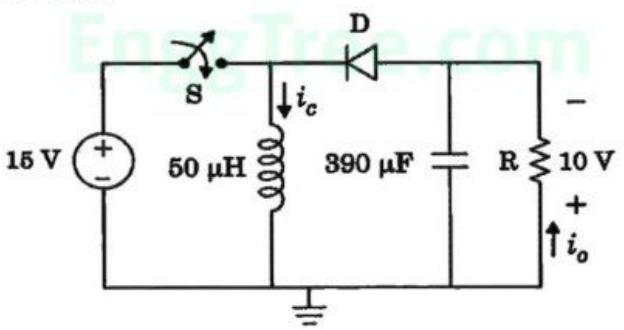


Fig. 4.