X/K/TY

Reg. No:

# Final Assessment Test – November 2025

**VIT** Vellore Institute of Technology

Course: **BEEE205L** - **Electronic Devices and Circuits**

Class NBR(s): **1212 / 1213**　　Slot: **C2**

Time: **Three Hours**　　Max. Marks: **100**

- **KEEPING MOBILE PHONE/ANY ELECTRONIC GADGETS, EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTICE**
- **DON'T WRITE ANYTHING ON THE QUESTION PAPER**

| COs | CO Statements |
|---|---|
| CO1 | Solve diode circuits for various applications. |
| CO2 | Analyze and design BJT and MOSFET DC circuits and their amplifier configurations |
| CO3 | Interpret frequency response of amplifiers |
| CO4 | Identify the impact of negative feedback in amplifier design. |

**BL – Blooms Taxonomy Level (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)**

**Answer ALL Questions**
**(10 X 10 = 100 Marks)**

1. a) Apply the clipping circuit principle to determine the output response of the given diode clipper shown in Fig. 1 for an input voltage $V_i = 12\ V_{max},$ analyze and compute the output voltage $V_o$ during both the positive and negative half cycles of the input waveform. Sketch both the input and output waveforms clearly to justify your analysis. (Assume si diode) **CO1 BL3**

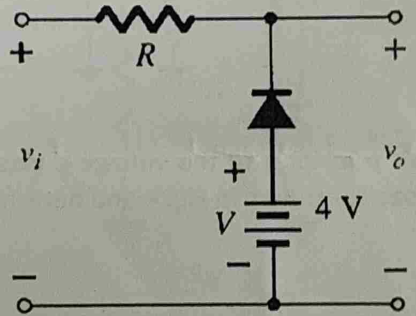


Fig. 1.

b) Apply the principles of clamping circuits to design an appropriate clamper that produces the output waveform shown in Fig. 2. Draw the circuit diagram and the corresponding input waveform, demonstrating how the designed circuit achieves the specified output shift.

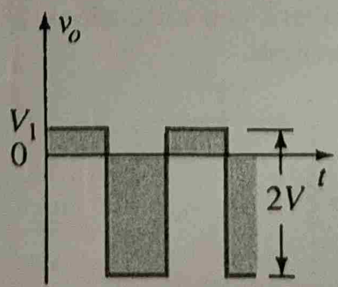


Fig. 2.

2. Explain the working principle of a center-tapped transformer full-wave rectifier with the help of a neat labeled circuit diagram and corresponding input and output waveforms. Derive the expression for the average (DC) output voltage, and interpret how the center-tap enables full-wave rectification. **CO1 BL2**

3. Explain the principle and operation of a BJT in the Common-Emitter configuration. With the aid of a neat labeled circuit diagram, describe the input and output characteristics, and interpret how the CE configuration provides voltage and current amplification. **CO2** **BL2**

4. Apply the DC biasing principles of BJT to the emitter-bias network shown in Fig. 3 and determine the following parameters: **CO2** **BL3**

a) Base current ($I_B$)
b) Collector current ($I_C$)
c) Collector–Emitter voltage ($V_{CE}$)
d) Collector voltage ($V_C$)
e) Emitter voltage ($V_E$)
f) Base voltage ($V_B$)
g) Base–Collector voltage ($V_{BC}$)

Show all necessary steps, equations, and substitutions clearly while applying Ohm's law and transistor current relations.

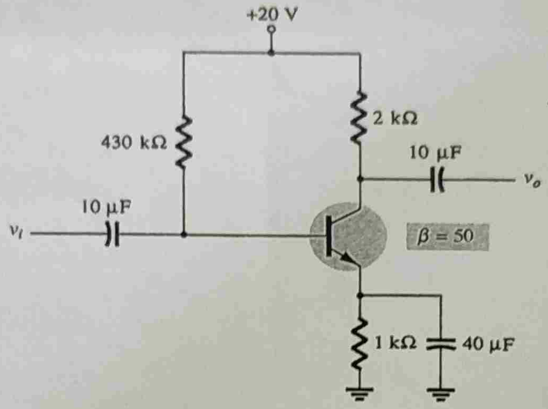


Fig. 3.

5. Apply both DC and AC analysis principles to the voltage-divider bias BJT amplifier circuit with emitter bypass capacitor shown in Fig. 4 and determine the following: **CO2** **BL3**

**DC Analysis:**

a. DC bias voltage $V_{CE}$,
b. Collector current $I_C$

**AC Analysis with bypass capacitor:**

c. Small-signal emitter resistance $r_e'$
d. Input impedance $Z_i$
e. Output impedance $Z_o$
f. Voltage gain $A_v$

Clearly show all the circuit equations and calculations. Sketch the equivalent AC circuit diagram to support your analysis.

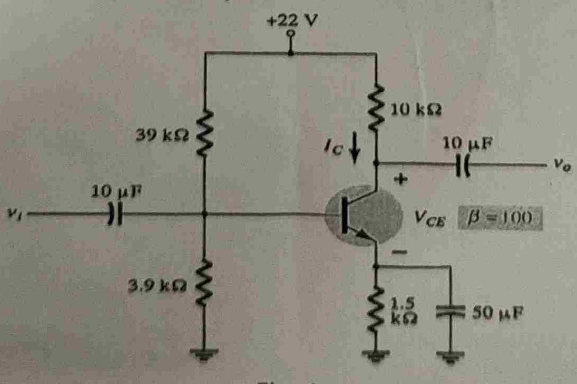


Fig. 4.

6. Apply DC and AC analysis techniques to the voltage-divider biased BJT amplifier circuit (without emitter bypass capacitor) shown in Fig. 5, and determine the following parameters: **CO2** **BL3**

**DC Analysis:**
a. DC bias voltage $V_{CE}$
b. Collector current $I_C$
**AC Analysis (Without Bypass Capacitor):**
c. Small-signal emitter resistance $r_e'$
d. Input impedance $Z_i$
e. Output impedance $Z_o$
f. Voltage gain $A_v$ considering the unbypassed emitter resistor
Draw the small-signal AC equivalent circuit and show all required steps, equations, and calculations.

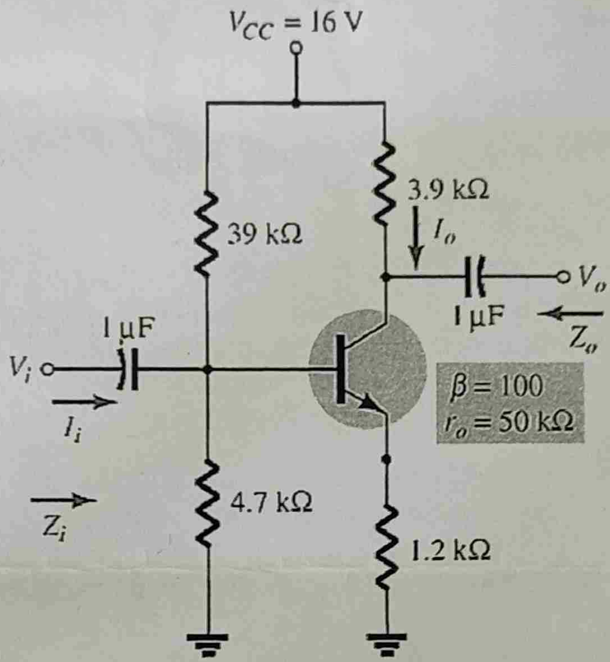


Fig. 5.

7. Explain the construction and working principle of an Enhancement-type MOSFET, with the help of neat labeled diagrams, describe its drain and transfer characteristics, and interpret how gate-to-source voltage controls the channel formation and drain current. **CO2** **BL2**

8. Apply DC and AC analysis principles to the E-MOSFET Common-Source amplifier (without source resistor $R_S$) circuit shown in Fig. 6, and determine the following parameters: **CO2** **BL3**

**DC Analysis:**
a. Gate voltage $V_G$
b. Drain current $I_D$
c. Drain-to-source voltage $V_{DS}$
**AC Analysis:**
d. Small-signal transconductance $g_m$
e. Input impedance $Z_i$
f. Output impedance $Z_o$
g. Voltage gain $A_v$
Clearly show the AC equivalent circuit, indicate all steps, assumptions, and substitutions, and justify how each parameter influences the amplifier performance.

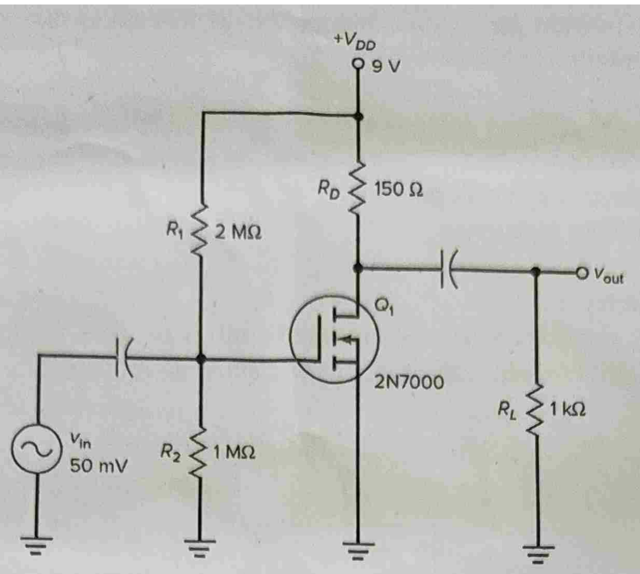


Fig. 6.

| | | | |
|---|---|---|---|
| 9.a) | Explain the frequency response of a BJT amplifier. With the help of neat labeled diagrams, describe how the gain varies with frequency and identify the low-frequency, mid-frequency, and high-frequency regions. Discuss the influence of coupling and bypass capacitors on the overall response of the amplifier. | **CO3** | **BL2** |
| | **OR** | | |
| 9.b) | Explain the frequency response of a MOSFET amplifier. With the help of neat labeled diagrams, describe how the voltage gain varies with frequency, and identify the low-frequency, mid-frequency, and high-frequency regions. Discuss the influence of coupling capacitors and bypass capacitors on the amplifier's overall frequency response and bandwidth. | **CO3** | **BL2** |
| 10.a) | Explain the concept and operation of Voltage–Shunt and Current–Series negative feedback amplifiers. With the help of neat labeled circuit diagrams, describe how negative feedback influences the gain of an amplifier. Derive the expression for the closed-loop voltage gain. | **CO4** | **BL2** |
| | **OR** | | |
| 10.b) | Explain the concept and operation of Voltage–Series and Current–Shunt negative feedback amplifiers. With the help of neat labeled circuit diagrams, describe how negative feedback influences the gain of an amplifier. Derive the expression for the closed-loop voltage gain. | **CO4** | **BL2** |

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