



**ELIZADE UNIVERSITY ILARA MOKIN,
ONDO STATE**

FACULTY OF ENGINEERING

**DEPARTMENT OF ELECTRICAL AND
COMPUTER ENGINEERING**

FIRST SEMESTER EXAMINATION, 2017/2018 ACADEMIC SESSION

COURSE TITLE: ELECTRONIC CIRCUIT I

COURSE CODE: EEE 321

EXAMINATION DATE:

COURSE LECTURER: DR K. O. TEMIKOTAN

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HOD's Signature

TIME ALLOWED: 2 HOURS 30 MINUTES

INSTRUCTION

1. ANSWER ALL QUESTIONS IN SECTION A AND FOUR QUESTIONS IN SECTION B
2. SEVERE PENALTIES APPLY FOR MISCONDUCT, CHEATING, POSSESSION OF UNAUTHORIZED MATERIALS DURING EXAM.
3. YOU ARE NOT ALLOWED TO BORROW ANY WRITING MATERIALS DURING THE EXAMINATION.

SECTION A

Answer ALL questions in this section

- i. A semiconductor has _____ temperature coefficient of resistance
- ii. In an N-type of material the electron is called the _____ while the hole is called _____
- iii. The quantity r_e' is normally obtained by dividing 25mA by _____
- iv. A Class 'A' amplifier has an ac signal output of (half, Full) cycle while Class 'B' has output of (half, full) cycle
- v. A common emitter circuit connected such that the collector resistance equals zero is called _____
- vi. The source current is equal to the drain current because the gate has _____
- vii. In a JFET drain characteristics, the pinch off region is also referred to as _____ region
- viii. An _____ is a circuit that generates a continuously repetitive output signal
- ix. An amplifier that is designed to amplify the difference between two input signals is _____ amplifier.
- x. Class 'C' amplifiers are invariably employed in _____ amplifiers. [12 marks]

SECTION B

Answer ANY FOUR questions in this section

Question 1

- (a) A junction field effect transistor has the transfer characteristics shown in Figure 1.

Find (i) the pinch off voltage and (ii) derive an appropriate equation for the drain current. [3marks]

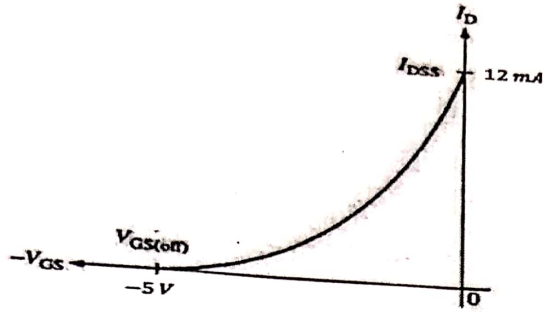


Figure 1 Transfer Characteristics of a JFET

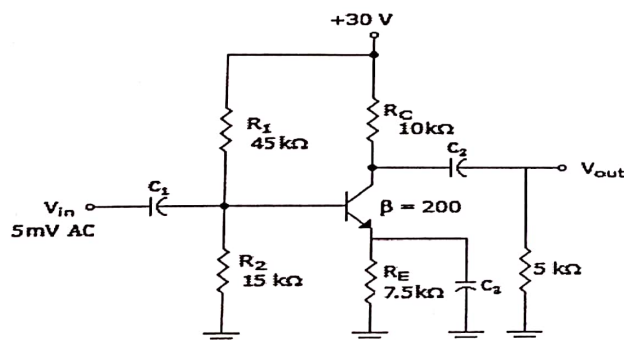
- (b) A JFET has an I_{DSS} of 9 mA and a $v_{GS(off)}$ of $-3V$. Find the value of drain current when $V_{GS} = -1.5V$. [2 marks]
- (c) Define the JFET parameters and establish the relationship between them [4marks]
- (d) Compare BJTs and Field effect transistors. [3 marks]

Question 2

- (a) Draw the output characteristics of a bipolar junction transistor and show the following regions (i) cut off region. (ii) Saturation region and (iii) active region. In which of these regions can you obtain faithful amplification? [5 marks]
- (b) The common base (CB) amplification factor is α , and the common emitter amplification factor is β .
Express (i) β in terms of α (ii) α in terms of β . [2marks]
- (c) Using a suitable and neat diagram, show how a load line is obtained. [5 marks]

Question 3

For the circuit in Figure 2, compute (i) $r_{in(base)}$ (ii) A_v (iii) V_{out} and r_{in}



[12 marks]

Figure 2: For Question 3

Question 4

- a) Express the input impedance, current gain, voltage gain, and output admittance of an amplifier in terms of the hybrid parameters. [4 marks]
- b) A junction transistor has the following parameters;

$$h_{ie} = 2 \text{ k}\Omega; h_{re} = 1.6 \times 10^{-4}; h_{fe} = 50; h_{oe} = 50 \mu\text{A/V}$$

Given that the load resistance (R_L) is $12 \text{ k}\Omega$, and the source resistance (R_S) is 500Ω , determine:

- i. The current gain
- ii. The input resistance
- iii. The voltage gain
- iv. The output resistance

[8 marks]

Question 5

- (a) What are the advantages of negative feedback in amplifiers? [3 marks]
- (b) An amplifier with voltage gain of 60 dB uses $\frac{1}{20}$ of its output in negative feedback. What is the gain with feedback in dB? [2 marks]
- (c) What are the attributes of an ideal operational amplifier? [3 marks]
- (d) A summing integrator made from op amp has three inputs v_1 , v_2 , and v_3 with three resistors R_1 , R_2 , and R_3 connected in series with them respectively. $R_1 = 100\text{K}$, $R_2 = 200$, $R_3 = 1\text{M}$ and $C = 1 \mu\text{A}$ Find the output voltage v_o . [4 marks]

Question 6

- (a) Why are heat sinks used with power amplifiers? [2 marks]
- (b) A power transistor has thermal resistance $\theta = \frac{300^\circ\text{C}}{\text{W}}$. If the maximum temperature is 90°C and the ambient temperature is 30°C , find the maximum permissible power dissipation. If a heat sink is used with the transistor, the value of θ is reduced to 60°C/W . Find the maximum power dissipation. [4marks]
- (c) A Class 'B' push pull amplifier has an efficiency of 60% and each transistor has a rating of 2.5 W. Find the ac output power and the dc input power. [4 marks]
- (d) Why are push pull amplifiers used in the output stages of power amplifier? [2marks]