ELIZADE UNIVERSITY ILARA MOKIN, ONDO STATE

FACULTY OF ENGINEERING

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

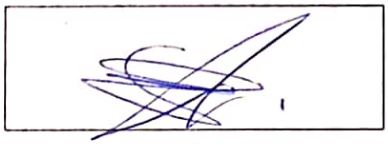
SECOND SEMESTER EXAMINATION, 2020/2021 ACADEMIC SESSION

COURSE TITLE: ELECTRONIC CIRCUIT I

COURSE CODE: EEE 321

EXAMINATION DATE: March 22, 2021

COURSE LECTURER: DR K. O. TEMIKOTAN



HOD's Signature

TIME ALLOWED: 3 HOURS

INSTRUCTION

1. ANSWER ANY **FIVE** QUESTIONS
2. SEVERE PENALTIES APPLY FOR MISCONDUCT, CHEATING, POSSESSION OF UNAUTHORIZED MATERIALS DURING EXAM.
3. YOU ARE NOT ALLOWED TO BORROW ANY WRITING MATERIALS OR CALCULATORS DURING THE EXAMINATION.
4. SMART WATCHES OR SIMILAR DEVICES ARE NOT ALLOWED IN THE EXAMINATION VENUE.

QUESTION ONE

a. What is the drawback of a standard common emitter (CE) amplifier circuit? (2 marks)
b. Using a neat diagram, show how a swamped CE amplifier is connected. (2 marks)
c. What is the purpose of using a swamped connection? (1 mark)
d. For the amplifier circuit shown in Figure Q 4, find the voltage gain of the amplifier with (i) C_E connected in the circuit (ii) C_E removed from the circuit. Comment on the results. (7 marks)

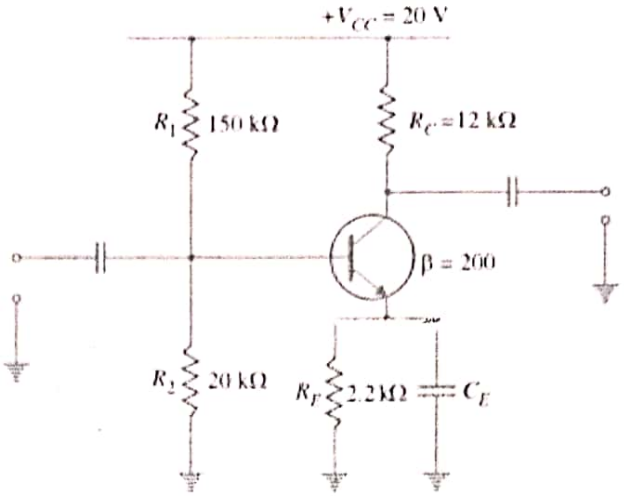


Figure Q 1

QUESTION TWO

a. Using neat diagrams, show the difference between positive and negative feedback (4 marks)
b. List four (4) advantages of negative feedback (2 marks)
c. Show that voltage gain with negative feedback A_{vf} is given by this expression:

$$A_{vf} = \frac{A_v}{(1+m_v A_v)}$$ (6 marks)

QUESTION THREE

a. List four (4) common methods of biasing bipolar junction transistors. (2 marks)
b. Design a base resistor bias circuit for a CE amplifier such that operating point is V_{CE} = 8V and I_C = 2 mA. You are supplied with a fixed 15V d.c. supply and a silicon transistor with β = 100. Take base-emitter voltage V_{BE} = 0.6V. (10 marks)

QUESTION FOUR

a. What is the difference between tuned amplifiers and other amplifiers? (1 mark)
b. For the tuned circuit shown in Figure Q 4, show that the resonant frequency is

$$f_r = \frac{1}{2\pi}\sqrt{\frac{1}{LC} - \frac{R^2}{L^2}}$$ (2 marks)

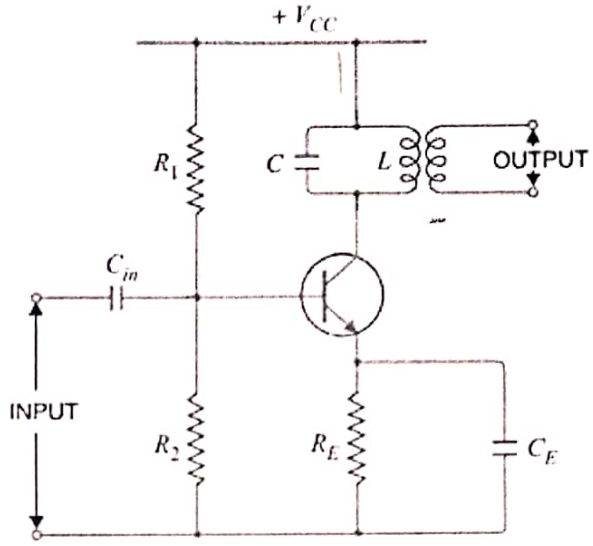


Figure Q 4 Tuned Amplifier Circut

c. What is the resonant frequency if the resistance R of the inductor is so small that it can be ignored? (1 mark)
d. Define quality factor of a tank circuit. (2 marks)
e. Using a neat sketch of the impedance vs frequency curve show how the value of the resistance affect the impedance of the tuned amplifier. (2 marks)
f. A parallel resonant circuit has a capacitor of 100 pF in one branch and inductance of 100 μH plus a resistance of 10 Ω in parallel branch. If the supply voltage is 10 V, calculate (i) resonant frequency (ii) impedance of the circuit and (iii) line current at resonance. (4marks)

QUESTION FIVE

a. List five (5) properties of operational amplifiers. (4 marks)
b. A three-stage OP-amp circuit is required to provide voltage gains of +10, – 18 and –27. Design the OP-amp circuit. Use a 270 kΩ feedback resistor for all three circuits. What output voltage will result for an input of 150 μV? (8 marks)

QUESTION SIX

a. List three (3) important properties of the Darlington amplifier. (2 marks)
b. Draw a typical Darlington amplifier circuit showing the currents in the terminals (4 marks)
c. For the Darlington amplifier in Figure Q 6, find (i) the d.c. levels of both transistors and (ii) a.c. emitter resistances of both transistors. (6 marks)

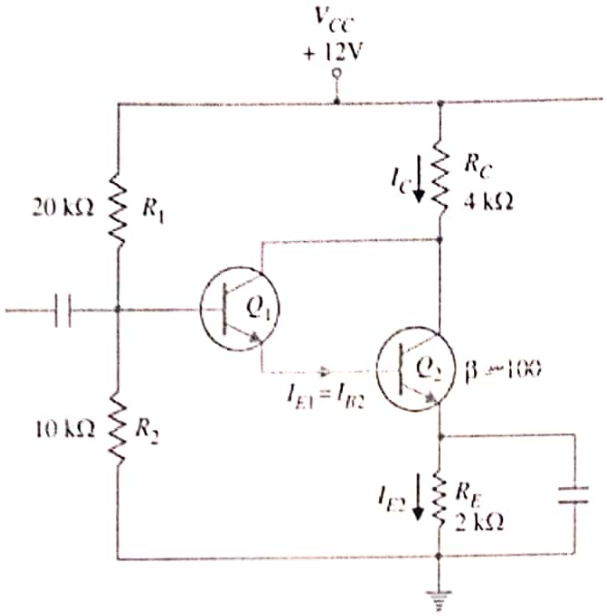


Figure Q 6

QUESTION SEVEN

a. Figure Q 7 shows voltage divider biasing arrangement for n-channel E-MOSFET. The circuit components are R_1, R_2, and R_D. Express (i) V_{GS} (ii) V_{DS} (iii) I_D in terms of the supply voltage and the resistances in the circuit. (3 marks)

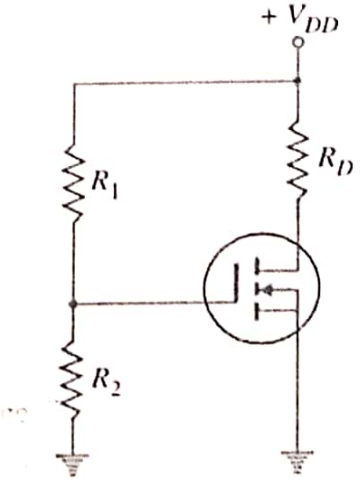


Figure Q 7 (i)

b. For the E-MOSFET circuit in Figure Q7(ii), determine (i) V_{GS}, (ii) the value of the constant K and (iii) V_{DS}.

The data sheet for this particular MOSFET gives $I_{D(on)}$ = 500 mA at V_{GS} = 10V and $V_{GS(th)}$ = 1 V. (9 marks)

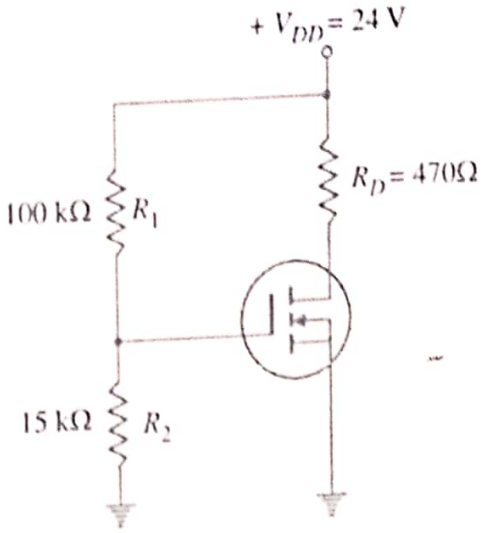


Figure Q 7 (ii)