



MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY

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UNIVERSITY EXAMINATIONS 2024/2025

SECOND YEAR, FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR
OF TECHNOLOGY IN ELECTRICAL AND ELECTRONICS ENGINEERING AND
BACHELOR OF EDUCATION TECHNOLOGY IN ELECTRICAL AND ELECTRONICS
ENGINEERING

EET 3201: ANALOGUE ELECTRONICS I

DATE: JANUARY 2025

TIME: 2 HOURS

INSTRUCTIONS: Answer Question ONE and any other TWO questions.

QUESTION ONE (30 MARKS)

- A signal with power 3 mW is distorted by noise with power 0.001 mW. Calculate the signal to noise ratio (SNR) in dB. (2 Marks)
- Determine whether or not the transistor in Fig.Q1(b) is in saturation. Assume $V_{CE(sat)} = 0.6$ V. (6 Marks)



MUST is ISO 9001:2015 and



ISO/IEC 27001:2013 CERTIFIED

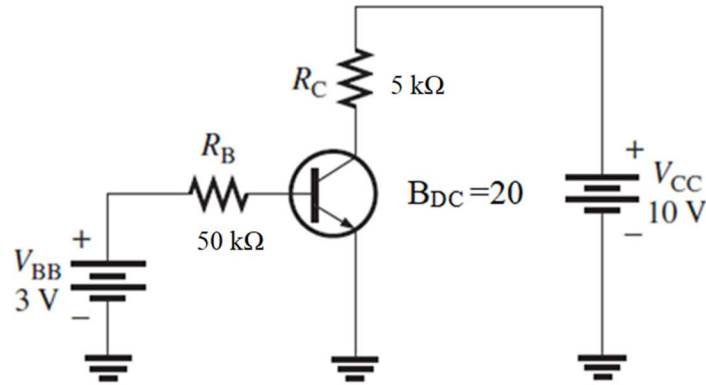


Fig. Q1(b)

- State and explain any three differences between JFETs and MOSFETs. (6 Marks)
- The reverse saturation current of an NPN transistor in common-base circuit is $80 \mu\text{A}$. For an emitter current of 8 mA , the collector current is 5 mA . Determine the current gain and base current. (3 Marks)
- With the help of Fig. Q1(e), explain how push - pull power amplifiers reproduce waveforms. (5 Marks).
- Give the h parameter equivalents of β_{ac} and α_{ac} . (2 Marks)
- Derive and plot the dc load line for a JFET. (4 Marks)
- Explain the difference between internal and external noise in amplifiers. (2 Marks)

QUESTION TWO (15 MARKS)

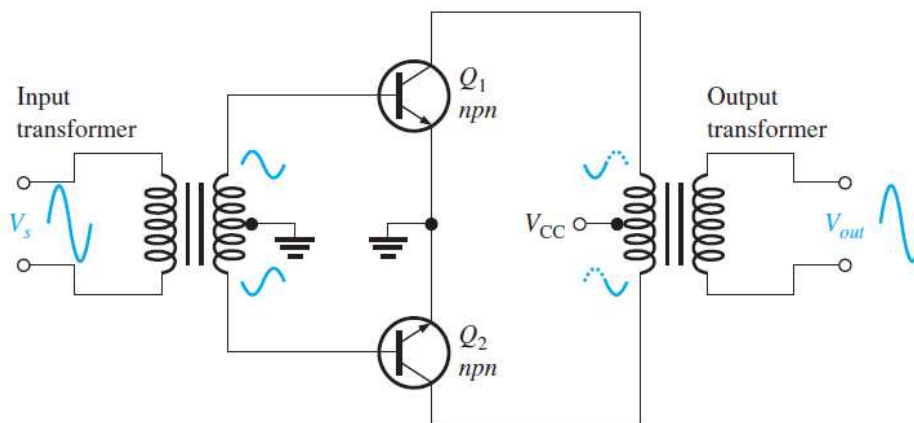


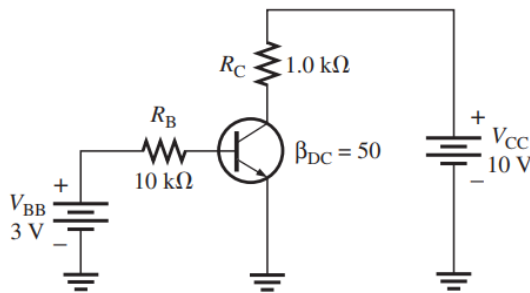
Fig. Q1(e)

- Sketch the basic structure and schematic symbol of an NPN BJT. (2 Marks)

- b). With the help of a well labelled diagram, explain the transistor action in a PNP BJT transistor. (6 Marks)
- c). Derive the relationship between β_{DC} and α_{DC} parameters of an amplifier. (5 Marks)
- d). Define the following terms.
- Power amplifier
 - DC quiescent power (2 Marks)

QUESTION THREE (15 MARKS)

- a). With the help of well labelled diagrams, compare the Enhancement and Drain MOSFET Transfer Characteristics. (8 Marks)
- b). For a certain D-MOSFET, $I_{DSS} = 15\text{mA}$ and $V_{GS(off)} = +8\text{ V}$. Determine:
- Whether the transistor is an n-channel or a p-channel one.
 - I_D at $V_{GS} = -2\text{V}$
 - I_D at $V_{GS} = +2\text{v}$ (3 Marks)
- c). Determine I_B , I_C , I_E , V_{BE} , V_{CE} , and V_{CB} in the circuit of Fig. Q3(c) if it has $\beta_{DC} = 50$ (4 Marks)



QUESTION FOUR (15 MARKS)

- a) With the help of diagrams, describe input and output characteristics of an NPN Common Base (CB) amplifier. (9 Marks)

- b) With the help of a well labelled diagram, explain the operation of an Enhancement MOSFET. (6 Marks)

QUESTION FIVE (15 MARKS)

- a) Define the following terms:
- i). Oscillator.
 - ii). Positive feedback
 - iii). Negative feedback (3 Marks)
- b) With the aid of diagrams, explain the operation of a power amplifier. (5 Marks)
- c) With the aid of diagrams, explain how an oscillator starts up and then sustains its oscillations. (7 Marks)