



MACHAKOS UNIVERSITY

University Examination 2018/2019

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

FIRST YEAR SECOND SEMESTER EXAMINATION FOR

DIPLOMA IN ELECTRICAL AND ELECTRONIC ENGINEERING (TVET)

2601/106: ANALOGUE ELECTRONICS

DATE: 15/4/2019

TIME: 8.30-11.30 AM

INSTRUCTIONS:

Answer question one and any other two questions.

QUESTION ONE COMPULSORY (30 MARKS)

- a) With the aid of a diagram describe the electrostatic field deflection in a Cathode Ray Oscilloscope. Hence determine the expression for velocity of electron in X – direction as it enters the deflecting plates. (9 marks)
- b) With the aid of circuit diagrams, describe the operation of;
 - i. A bi – phase full wave rectifier
 - ii. Step down switching regulator. (14 marks)
- c) With the aid of a drain characteristics curve explain the operation of an N – channel Junction Field Effect Transistor (JFET) (7 marks)

QUESTION TWO (20 MARKS)

- a) State THREE;
 - i) Differences between Bipolar and Unipolar Junction Transistors.
 - ii) Precautions that should be observed while handling MOSFETs. (6 marks)
- b) Figure 1 shows a common source JFET amplifier. Given that the maximum value of drain current is 10mA, $V_{GS} = -2.2V$ at $I_D = 5mA$, Determine the;

- i) Self - bias operation point of the FET
- ii) Value of resistor R_S and R_D to obtain condition in question 2 a) (i). (14 marks)

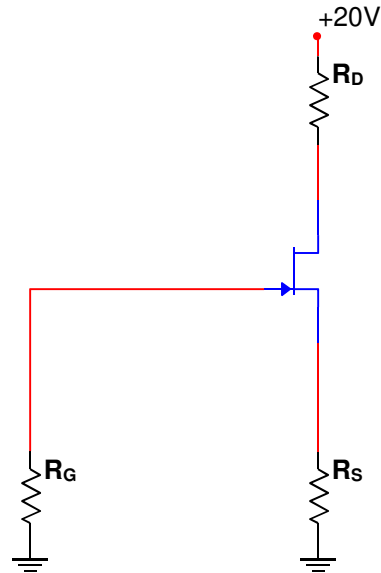


Figure 1

QUESTION THREE (20 MARKS)

Draw a well labelled;

- a) Structure of a N – channel JFET (3 marks)
- b) FET family tree. (17 marks)

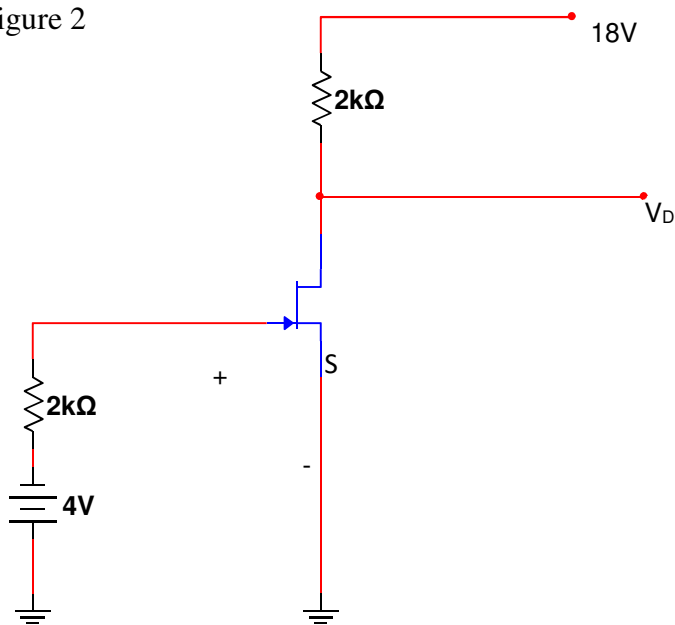
QUESTION FOUR (20 MARKS)

- a) State THREE properties of a cathode used in thermionic valves. (3 marks)
- b)
 - i Define “work function” in relation to electron emission. (2 marks)
 - ii Explain how “space charge” is formed in a vacuum diode. (3 marks)
- c) Explain the process of thermionic emission and give ONE application. (3 marks)
- d) With the aid of a labelled block diagram explain the operation of a cathode ray oscilloscope (CRO). (9 marks)

QUESTION FIVE (20 MARKS)

- a) With the aid of labelled diagrams explain the principle of operation of an N – channel Junction Field Effect Transistor (JFET) when biased from two sources. (8 marks)
- b) Figure 2 shows a fixed bias configuration of a JFET amplifier circuit having I_{DSS} of 8mA and $V_P = -4V$. Determine;
- V_D
 - V_{GS}
 - I_D
- (7 marks)

Figure 2



- c) Figure 3 shows a common source self - biased JFET amplifier with $I_{DSS} = 8mA$, $V_P = -6V$. The Q – point occurs at $I_{DQ} = 4mA$. Assuming $R_D = 3R_S$, determine the value of resistor R_S and R_D . (5 marks)

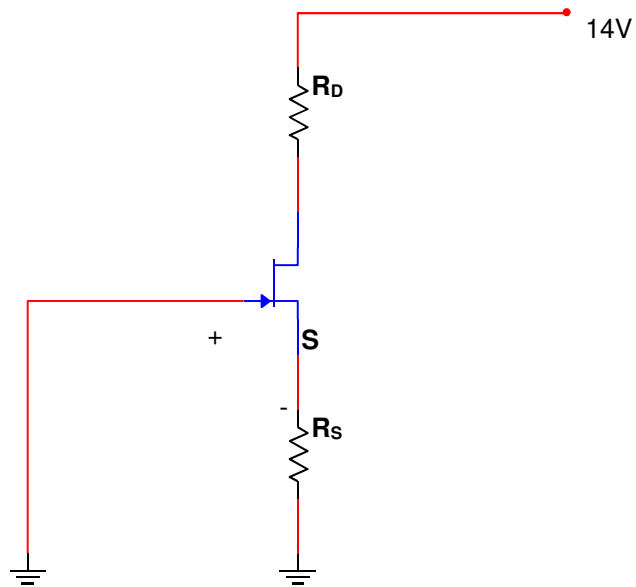


Figure 3