



NATIONAL OPEN UNIVERSITY OF NIGERIA
PLOT 91, CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESSWAY, JABI - ABUJA
FACULTY OF SCIENCES
DEPARTMENT OF PURE AND APPLIED SCIENCES
SEPTEMBER, 2020_1 EXAMINATION

COURSE CODE: PHY 310
COURSE TITLE: ELECTRONICS II
CREDIT UNIT 2
TIME ALLOWED (2½ HRS)

INSTRUCTION: *Answer question 1 and any other three questions*

QUESTION 1 [25 MARKS]

- a) Briefly explain two advantages of JFET over BJT and hence explain why JFET is more desirable for certain applications than the BJT [3 Marks]
- b) Using a block diagram, explain the multistage amplifier and state THREE (3) advantages over single stage amplifiers [7 Marks]
- c) Using diagram, explain the process of half wave rectification. Your diagram should clearly show the circuit, input and output wave forms [5 Marks].
- d) Using a diagram, explain the Low Pass Filter (LPF) and assuming a LPF circuit consisting of a resistor of $47k\Omega$ in series with a capacitor of $47nF$ is connected across a $10v$ sinusoidal supply. Calculate the output voltage (V_{OUT}) at a frequency of 100 Hz [10 marks]

QUESTION 2 [15 MARKS]

- a) Sketch the cross section of a P-channel MOSFET and label its four terminals. State the significance of the fourth terminal and explain why it is not trivial. [6 Marks]
- b) The LIST and explain three regions of operation associated with MOSFET transistors output curves. [6 Marks]
- c) Draw the drain current and transfer characteristic of a common source N channel D MOSFET [3 marks]

QUESTION 3 [15 MARKS]

- a) The bandwidth of the common-emitter amplifier tends to be low due to high internal capacitance. Briefly explain four ways in which this problem can be eliminated [8 marks]
- b) Write the expression of the voltage gain for a common source. For a common source JFET, voltage amplifier, $g_m = 2ms$ and $R_L = 10\text{ k}\Omega$. Find its voltage amplification assuming $r_d \gg R_L$ [5 marks]
- c) What is the Miller effect and how does a negative feedback affect the input impedance of an amplifier? [2 marks]

QUESTION 4 [15MARKS]

- a) What is a transformer and using a diagram explain the operation of a Step Down Transformer? [6 marks]
- b) Compare direct current and alternating current power transmission and state the major advantage of direct current transmission [6 marks]
- c) What are the benefits of high voltage electricity transmission and problem associated with the direct current ? [3 marks]

QUESTION 5

- a) Discuss the function of filter capacitors in power supplies [2 marks]
- b) What do voltage regulators do and discuss the role regulators play in power supplies [3 marks]
- c) Compare and contrast the benefits and shortcomings of linear and switching power supplies [10 marks]

QUESTION 6

- a) Explain drop-out voltage as applied to regulators and if $V_{IN} = 3.5 \text{ V}$ when $V_{OUT} = 3.2 \text{ V}$, what is the dropout voltage? [4 marks]
- b) Using diagram, describe the electrical function of filters. Sketch the single element filter topology [4 marks]
- c) Using diagrams where necessary, differentiate between low pass and high pass filter [7 marks]