Technological engineering and architecture electronics engineering department

Design, Architecture

TECHNOLOGICALINSTITUTE OF THE PHILIPPINES938 Aurora Blvd., Cubao, Quezon City COLLEGE OF ENGINEERINGAND ARCHITECTUREELECTRONICSENGINEERING DEPARTMENT 2ND SEMESTERAY 2017-2018PRELIM ELECTRONIC CIRCUITS ANALYSIS ANDDESIGNECE 402EE41FC1 FrequencyResponse of Common-Base and Common-Emitter AmplifiersLABORATORY NO. 2 Submittedto: Engr. Reginald Phelps T. Laguna Submittedon: January 9, 2017Submittedby: Braga, Nolidhon A.

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Frequency Response ofCommon-Base and Common-Emmiter AmplifiersLaboratoryNo. 2Abstract—The word amplifier is used in this laboratory report isa circuit (or stage) in manner, by utilizing a single active device rather thana complete a system such as an integrated circuit operational amplifier. Theamplifier is a device that is used to enhance the power of a signal.

This is doneby taking energy from a PSU (power supply unit) and controlling the output to replicatethe shape of the input signal but with a larger (voltage or current) amplitude. In this sense, it may be thought of as modulating the voltage or current of thepower supply to produce its output.

I. Introduction In Electronics, Small signals amplifiersare commonly used devices as they can amplify a relatively small input signal, for example from a sensor such as a photo-device, into a much larger outputsignal to drive a relay, lamp or loudspeaker. In this

experiment wewould tackle different concepts regarding the frequency response of acommon-base and common-emitter amplifier configurations.

II. ObjectivesIn this laboratory experiment our grouphas the following objectives: (1) to characterize how frequency affects thegain of an amplifier; (2) to determine how the capacitance affects the gain ofan amplifier;(3) to determine the upper and lower cut-off frequency of anamplifier. (4) to be able to utilize and apply different concepts regardingthis topic and (5) to be able to create and be successful in gathering data inthis experiment.

III. Calculations A. Calculationfor Common BaseRTH= 9375 k? VTH = VBVB = VCC*R2/R1+R2VB = 0.

9375 V VE = VB — VBEVE= 0. 9375 — 0. 7VE = 0. 2375 VVR1 = 13. 39 VVR2 = 0.

871 V IB= 13. 39 V/150 k ? — 0. 871V/10 k ? IB = 2. 1667×10-6 A IE = VE/RSIE = 0.

2375V/1000 ? IE = 0. 2375 mA IC = IE — IBIC= 0. 2375 mA — 2. 1667×10-6AIC = 0. 2353 mA ? = hfe= IC/IBHfe = 0. 2353 mA/2.

1667 ? AHfe = 108. 615 1/t1 = 1/t11 + 1/t1T11= C1{R3+R2||(hfc/1+hfc)}T11 = 2. 10 mS T1= C2{R1|| R2||(hie+hfc)(R3*RS/R3+RS)}T1 = 271 mS 1/t1 = 1/2. 10mS + 1/271mS1/t1 = 479. 88 S 1/t2 = 1/C3(R4+R6)1/t2 = 3. 33 S fL= 1/2? ?(439. 880)2 + (3.

33)2fL = 76. 37 Hz Vout = 0. 707(2. 95)Vout = 2. 0927 V A.

CommonEmitter Calculation R1S= RTHRTH = R1|| R2RTH = 9375? RC= RE|| (RS+hIe/hfe)RC= 1k?||(9375+5100/1000)RC = 117. 6? FLe= 1/2? (117. 6) (47µF)FLE = 28. 79 Hz Vout = 3.

6(0. 704)Vout = 2. 5452

V

IV. SimulationsLTSpice is freeware software that is usedto implement a Simulation Program with Integrated Circuit Emphasis (SPICE)simulator of electronic circuit. The software is utilized in this project tocreate a precise measurement and outcome. A. CommonEmitter Simulation Fig. 1.

0 –Current of Input Signal andOutput Signal Fig. 1. 1 – Input Signal at the Base Fig. 1.

2 – Current of Input and OutputSignal B. CommonBase Simulation Fig. 1. 3 – Voltage Comparison at the Inputand Output Signal Materials, Tools, Equipment and Testing

Devices· Oscilloscope· Powersupply· FunctionGenerator· Resistors(150K ohms, 10K ohms, 15K ohms, 1K ohms, 100 ohms)

· Capacitor(47 uF, 10 uF)· Transistor· Breadboard· AlligatorWires / Cable Wires· DigitalMultimeter A. Common Emitter Output graph of Common Emitter B.

Common Base

V. Navegatingequipment to gather accurate data . Data and

Results A. Common Base Amplifier FL FH Calculated Measured Measured 76. 37 Hz 50Hz 1000Hz This table shows the calculated and measuredlower frequency (FL) and higher frequency (FH) 10x Frequency 5 15 20 35 45 Vin 1. 03mV 1.

00mV 1. 05 mV . 98 mV 1. 08 mV Vout 302 mV 420. 1 mV 653.

1 mV 830 mV 1. 02V Gain 293. 2 420. 1 62. 2 846. 94 944.

44 Gaindb 49. 43 52. 47 55. 88 58. 56 59. 5 10x Frequency 60 70 80 90 100 Vin 1. 20 mV 1.

23 mV 1. 02 mV 1. 03 mV 1. 03 mV Vout 1. 350V 1. 56V 1. 69V 1. 81V 1.

99V Gain 1125 1268. 29 1656. 86 1757. 28 1895. 24 Gaindb 59. 5 61. 02 66.

39 64. 9 65. 55 The relationship between gain and frequency is directlyproportional B. Common Emitter Amplifier FL FH Measured Calculated Measured 50 Hz 28. 79 Hz 1000 Hz 10x Frequency 5 15 25 40 50 Vin 0. 99mV 1 mV 1. 02 mV 1.

35V 1. 56V Vout 400 mV 850 mV 1. 1V 1. 35 V 1.

56 V Gain 404. 04 850 1078. 43 1285.

71 1471. 07 Gain db 53. 13 58. 59 60.

66 62. 18 63. 36 10x Frequency 60 70 80 10 100 Vin 1. 73V 1. 85V 2. 01V 2.

74V 2. 53V Vout 1. 73 V 1.

85 V 2. 01 V 2. 74 V 2. 53 V Gain 1572. 73 1608. 7 1717.

95 1866. 67 1946. 15 Gain db 63. 93 64.

13 64. 7 65. 42 65. 78 The relationship between gain and frequency is directlyproportional

VI. ProblemsEncountered and Actions TakenProblems Encountered and Actions Taken Activity No. Problems Encountered Actions Taken 1 · Disrupted Waveform · wrong connection of wiring and components · re-configuring the oscilloscope · analyzing and thoroughly reconnecting

VII. Conclusionsand RecommendationsA.

ConclusionsWe therefore we conclude that theemitter current is greater than any other current in the transistor, being thesum of base and collector currents. With common-emitter amplifier andcommon-base amplifier configurations, the transistor parameter most closelyassociated with gain was ?. In the common-base circuit, we follow another basictransistor parameter the ratio between base current and emitter current whichis a fraction always less than 1. RecommendationsSoon, our group hoped to further exploredeeper concepts and theories regarding this topic.

They hoped to utilize theknowledge and skills they acquired in the succeeding project. The following are the list ofrecommendation needed to complete the project:(1) Byfollowing the instruction carefully.

(2) Understandingand applying the concepts behind the experiment.

(3) Afollow-up simulation regarding this experiment.

These are the keytakeaways that will ensure that the project will be successful; together withteamwork, cooperation, and proper mindset.

VIII. Summary Smallsignals amplifiers are commonly used devices as they can amplify a relativelysmall input signal. The common-base configuration shows the signal source andthe load share the base of the transistor as a common connection point whilethe common-emitter configuration shows both the signal source and the loadshare the emitter lead as a common connection point. The common-emitterconfiguration commonly called as the " Voltage Divider Biasing" is a type ofbiasing arrangement that uses two resistors as a potential divider networkacross the supply with their center point supplying the required Base biasvoltage to the transistor.

IX. Questionsand Answers1. How does frequency relate to the gain ofan amplifier? The relation of frequency to gain is that the higher the frequencythe greater the gain and the lower the gain the lower the frequency 2.

What is the importance of knowing thefrequency response of an amplifier? The importanceof knowing the frequency response of an amplifier is that we can control the gainand adjust it to our desire. 3. What is the basis in getting the cut-offfrequency at 0.

707 times the maximum output value? The basisin getting the cut-off frequency at 0. 707 times the maximum output value is on thebandwidth frequency. 4. Why is it necessary to maintain the inputsignal at a constant level? In order to maintain a proper system and lessrisk of failure of the device/electronic, we need to maintain the input signal ata constant level. TaskDistribution Name of the Participant Task Distribution Cave, Levi John O. Documentation Braga, Nolidhon A.

Documentation Deocareza, Vicente II A. Documentation, and Computation Espinas, Jessa Eunice L. Documentation, and Computation Gumaru, Jhenord Documentation Tampoco, Eugenics P. Computation ReferencesHorowitz P.

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