INSTITUTE OF AERONAUTICAL ENGINEERING

(AUTONOMUS)
Dundigal, Hyderabad - 500 043

ELECTRONICS AND COMMUNICATION ENGINEERING

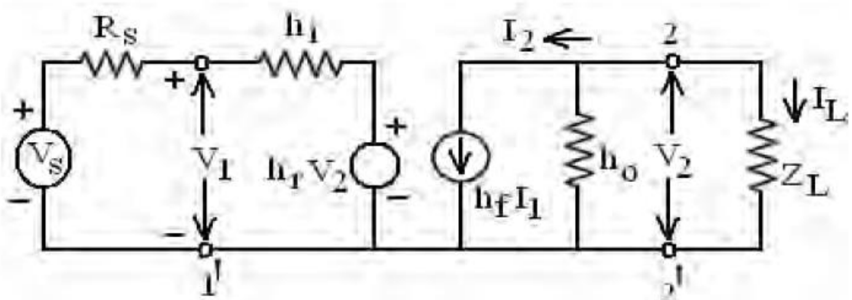
ASSIGNMENT

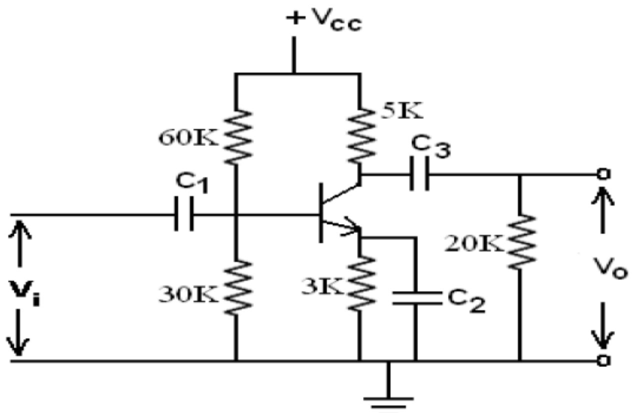
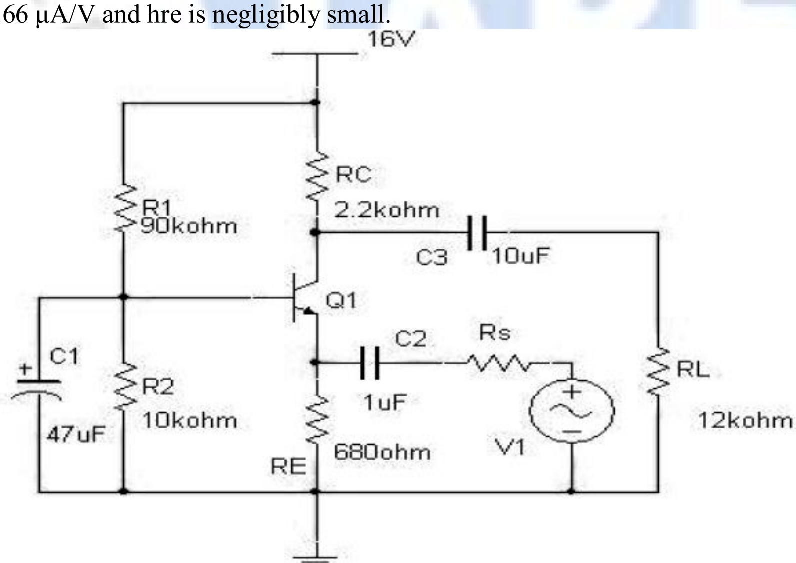
Course Name	:	**ELECTRONIC CIRCUIT ANALYSIS**
Course Code	:	**A40412**
Class	:	II - B. Tech 2nd semester
Branch	:	Electronics and Communication Engineering
Year	:	2016 – 2017
Course Faculty	:	Mrs. Deepthi.S, Mrs. Ajitha .G, Mrs. Shruthi .L, Mr. K Ravi

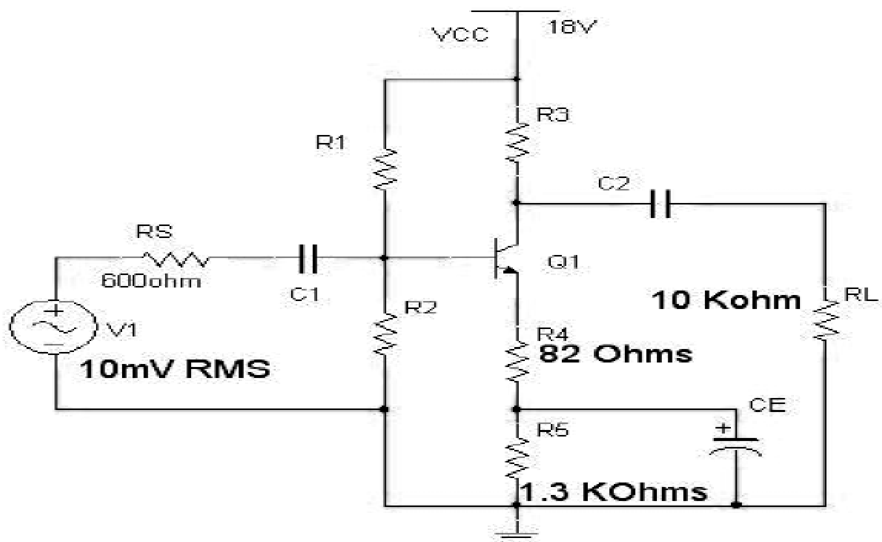
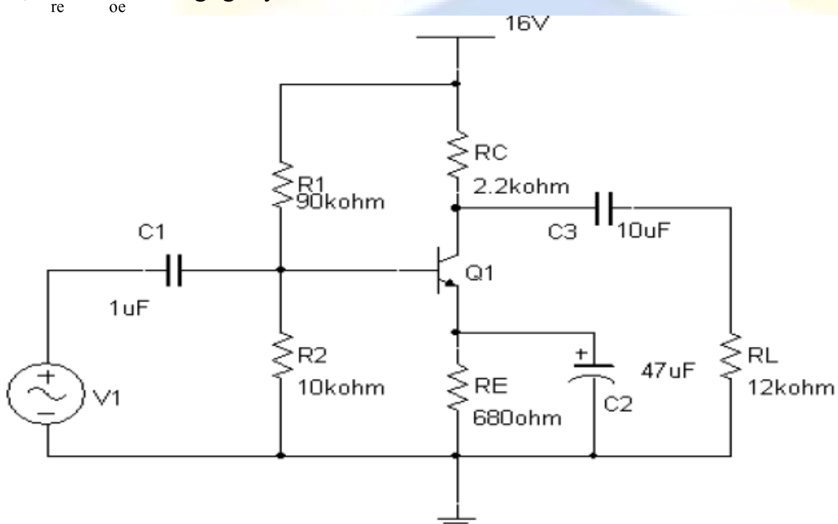
OBJECTIVES

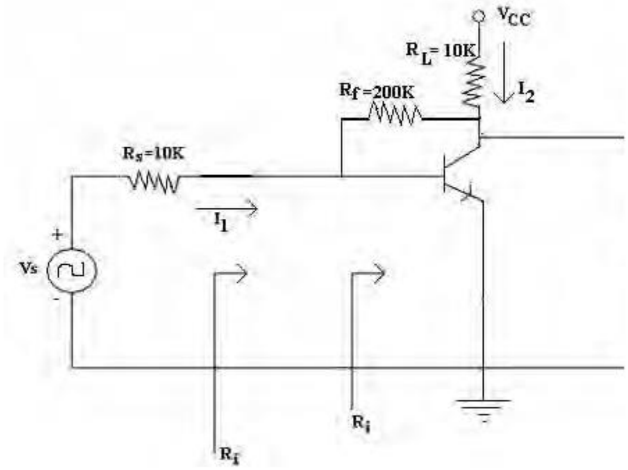
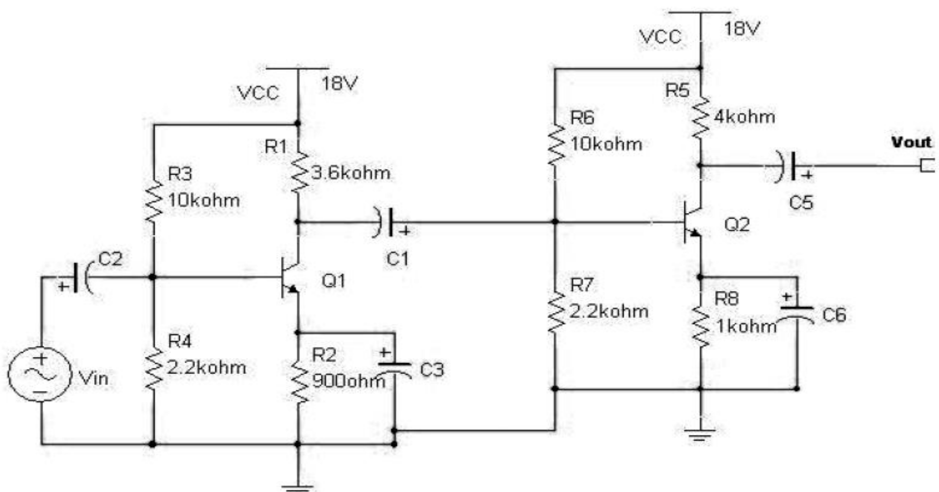
To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education. The major emphasis of accreditation process is to measure the outcomes of the program that is being accredited.

In line with this, Faculty of Institute of Aeronautical Engineering, Hyderabad has taken a lead in incorporating philosophy of outcome based education in the process of problem solving and career development. So, all students of the institute should understand the depth and approach of course to be taught through this question bank, which will enhance learner's learning process.

S. No	Question	Blooms Taxonomy Level	Course Outcome
	ASSIGNMENT-I UNIT-I SINGLE STAGE & MULTISTAGE AMPLIFIERS		
1.	For the circuit shown in figure, show that : (a) $(A_{VS})_{\max} = -\frac{h_f}{h_i h_o - h_r h_f}$ if $R_L = \infty$ & $R_S = 0$ (b) $R_i = \frac{h_i h_o - h_r h_f}{h_o}$ if $R_L = \infty$ 	Remember	1,8
2	(a) A transistor in CB circuit has the following set of `h' parameters. hib = 20Ω, hfb = 0.98,	Understand	1

S. No	Question	Blooms Taxonomy Level	Course Outcome
	hrb = 3*10^{-4}, hob = 0.5*10^{-6}. Find the values the ckt parameters if Rs = 600 and R_L = 1.5 kΩ. (b) Draw the CE amplifier with unby passed emitter resistance and derive expression for its ckt parameters		
3	For the circuit shown in figure , estimate the ckt parameters. All capacitors have negligible reactance at the test frequency, hie = 1kΩ, hfe = 99, hre , hoe are negligible.  	Remember	1,8
4	a) Reason out the causes and results of Phase & Frequency distortions in transistor amplifiers. b) Analyze what the output voltage should be if the DC power supply given to a CE amplifier is shorted to ground.	Analyze	1
5	For the CB amplifier circuit shown, compute RIN and ROUT if C1 is i) Connected ii) Not connected The h-parameters of the transistor in CE configuration are listed as: hie = 2.1KΩ, hfe = 81, hoe = 1.66 µA/V and hre is negligibly small.  	Analyze	1,8
6	For the amplifier circuit shown with partially unbypassed emitter resistance, calculate the voltage gain with R_4 in place and with R_4 shorted. Consider h_{ie} = 1.1KΩ, h_{fe} = 100, h_{re} & h_{oe} are negligibly small. Assume R_1 and R_2 to be 100KΩ and 22 KΩ respectively.	Remember	1,8

<table>
<tr><th>S. No</th><th>Question</th><th>Blooms Taxonomy Level</th><th>Course Outcome</th></tr>
<tr><td></td><td>
</td><td></td><td></td></tr>
<tr><td>7</td><td>For the common emitter amplifier shown, draw the AC and DC load lines. Determine the peak-to-peak output voltage for a sinusoidal input voltage of 30mV peak-to-peak. Assume C_1, C_2 and C_3 are large enough to act as short circuit at the input frequency. Consider h_{ie} = 1.1KΩ, h_{fe} = 100, h_{re} & h_{oe} are negligibly small.

</td><td>Understand</td><td>1,8</td></tr>
<tr><td>8</td><td>a) State Miller’s theorem Explain its significance in transistor circuit analysis.
b) What is non-linear distortion? List the causes for this type of distortion in amplifiers.</td><td>Understand</td><td>1</td></tr>
<tr><td>9</td><td>Draw the circuit diagram of a common collector amplifier along with its equivalent circuit. Derive expressions of its circuit parameters.</td><td>Understand</td><td>1</td></tr>
<tr><td>10</td><td>For the amplifier shown, calculate the ckt parameters. The h-parameter values are hfe = 50, hie = 1.1KΩ, hre = 2.5×10^{-4}, hoe = 24 µA/V.</td><td>Understand</td><td>1,8</td></tr>
</table>

S. No	Question	Blooms Taxonomy Level	Course Outcome
			
11	a) Explain various types of coupling mechanism used to couple multiple stages of amplifiers. b) Compare all the three types of coupling mechanisms	Remember	1
12	Derive expressions for performance parameters of a two-stage RC coupled amplifier using both simplified and exact hybrid model.	Remember	1
13	a)With the help of a neat circuit diagram, describe the working of a cascode amplifier. Explain the properties of cascode amplifier b) Derive expressions for performance parameters of a cascode amplifier	Remember	1
14	With the help of a neat circuit diagram, derive the expressions of performance parameters of a CE-CC amplifier ckt.	Remember	1
15	a)With the help of a neat circuit diagram, describe the working of a darlington emitter follower circuit. Derive expressions for performance parameters of a Darlington emitter follower circuit. b) Compare a single sage emitter follower and Darlington emitter follower ckt	Understand	1
16	a) discuss the effect on gain and bandwidth when n-identical amplifiers are cascaded b) For the two-stage RC coupled amplifier circuit shown, calculate the Individual stage voltage gains and the overall voltage gain. Input impedance of individual stages is given as 2.4 KΩ and β of individual transistors as 80. 	Apply	1,8
	UNIT-II **BJT AMPLIFIERS-FREQUENCY RESPONSE**		

S. No	Question	Blooms Taxonomy Level	Course Outcome
1	(a) Explain in detail, why a low frequency h-parameter model cannot be used for high frequencies analysis. (b) Draw the high frequency CE model of a transistor and explain the validity and importance of each element present in the hybrid-π model. (c) Explain the significance of two capacitors in hybrid-π model giving their typical values.	Analyze	2
2	(a) Derive the expressions for all the elements present in the hybrid-π model. (b) At I_c = 1mA and V_{CE}= 10V a certain transistor has the following data: C_c=3*p*F, h_{fe}=200, h_{oe}=25µA/V, h_{re}=$2*10^{-4}$,w_T=500Mrad/sec. Calculate the hybrid-π model parameters.	Understand	2,8
3	Derive the expressions for the following: (a) Short circuit current gain (explain in detail how the circuit is simplified for the analysis) (b) Current gain with resistive load (explain in detail how the circuit is simplified for the analysis) (c) f_α , f_β ,f_T	Apply	2
4	(a) Explain in detail the frequency response of a CE amplifier considering the low frequency and high frequency analysis. (b) Discuss the effect of coupling and bypass capacitors on the frequency response of the CE amplifier.	Understand	2
5	(a) Explain in detail the frequency response single stage CE transistor amplifier(voltage and current gain). (b) Explain the term gain bandwidth product (voltage and current gain band width product	Analyze	2
6	Explain with neat diagram an emitter follower at high frequencies.	Analyze	2
7	A transistor amplifier in CE configuration is operated at high frequency with the following specifications. f_T=6MHz, g_m=0.04,h_{fe}=50, $r_{bb'}$=100 Ω, R_s=500 Ω , $C_{b'c}$=10pF, R_L=100 Ω. Compute the voltage gain, upper 3dB cut-off frequency, and gain bandwidth product (GBW).	Understand	2,8
8	The hybrid - π parameters of the transistor at room temperature & for Ic = 1.3mA are gm = 50 mA/V, rb0e = 1K, rbb0 = 100 , rb0c = 4 M, rce = 80K, Cc= 3PF & Ce = 100 PF. Using Miller's theorem and the approximate analysis compute the upper 3dB frequency of the current gain and magnitude of the voltage gain at that frequency.	Remember	2,8
9	A transistor amplifier in CE configuration is operating at high frequency with the following specifications: f_T= 6 MHz, g_m = 0.04 mhos, h_{fe} = 50, r_{bb} = 100Ω, R_s = 500 Ω, C_C = 10pF, R_L = 100 Ω. Compute the voltage gain, upper 3 dB cut off frequency and gain bandwidth product.	Remember	2,8
10	a)Explain MOS small signal model. b) With a neat circuit diagram explain about the following common source stage and derive the expression for voltage gain for each Resistive load.	Apply	6
	UNIT-II **FEEDBACK AMPLIFIERS & OSCILLATORS**		
1	(a) If negative feedback with a feedback factor, β of 0.01 is introduced into an amplifier with a gain of 200 and bandwidth of 6 MHz, obtain the resulting bandwidth of the feedback amplifier. b) With the help of a suitable BJT based voltage series feedback amplifier diagram, explain the features and benefits of negative feedback in amplifiers.	Understand	3,8
2	(a)If the non-linear distortion in a negative feedback amplifier with an open loop gain of 100 is reduced from 40% to 10%with feedback, compute the feedback factor, β of the amplifier. b) Draw the circuit diagram of a current series feedback amplifier, Derive expressions to show the effect of negative feedback on input & output impedances, bandwidth, distortion of the amplifier.	Remember	3,8
3	(a)The β and the open loop gain of an amplifier are -10% and -80 respectively. By how much % the closed loop gain changes if the open loop gain increases by 25%? b) Compare the characteristics of feedback amplifiers in all the four configurations. c) Reason out why 2 stages are required to implement current shunt feedback.	Understand	3,8
4	(a)An amplifier has a gain of 50 with negative feedback. For a specified output voltage, if the input required is 0.1V without feedback and 0.8V with feedback, Compute β and open loop	Understand	3,8

S. No	Question	Blooms Taxonomy Level	Course Outcome
	gain. b) Through the block schematics, show four types of negative feedback in amplifiers. c) List the advantages of negative feedback in amplifiers.		
5	(a)Draw the circuit of a voltage series feedback circuit and explain it. (b) What are the possible amplifiers circuits in any feedback system? Discuss.	Understand	3,8
6	(a) Draw a feedback amplifiers in block diagram form and explain each block giving its function. (b) Distinguish between regenerative and degenerative feedback in amplifiers.	Remember	3,8
7	Deduce the Barkausen Criterion for the generation of sustained oscillations. How are the oscillations initiated?	Apply	3,8
8	Draw the circuit and explain the principle of operation of RC phase-shift oscillator circuit. What is the frequency range of generation of oscillations? Derive the expression for the frequency of oscillations.	Remember	4,8
9	Derive the expression for the frequency of Hartely & Colpitt oscillators.	Analyze	4,8
10	Derive the expression for the frequency of Wein Bridge Oscillators.	Analyze	4,8
11	(a) Draw the equivalent circuit for a crystal and explain how oscillations can be generated in electronic circuits, using crystals (b) Derive the expression for the frequency of Crystal Oscillators.	Apply	4,8
12	A Hartley oscillator is designed with L = 20μH and a variable capacitance. Find the Range of capacitance values if the frequency of oscillation is varied between 950 KHz to 2050 KHz.	Remember	4,8
	UNIT-1V LARGE SIGNAL AMPLIFIERS		
1	Explain the classification of power amplifiers based on the degree of conduction of the active device. Also write down the applications of each type.	Remember	5,8
2	With the help of neat diagram and graphical representation explain the operation of class-A power amplifier (resistive load). Derive the expression for efficiency and calculate the value of maximum efficiency.	Remember	5,8
3	With the help of neat diagram and graphical representation explain the operation of class-A power amplifier (transformer load). Derive the expression for efficiency and calculate the value of maximum efficiency.	Apply	5,8
4	With the help of neat diagram and graphical representation explain the operation of class-B power amplifier (push-pull configuration). Derive the expression for efficiency and calculate the value of maximum efficiency.	Analyze	5,8
5	With the help of neat diagram and graphical representation explain the operation of class-B power amplifier (complementary-symmetry). Derive the expression for efficiency and calculate the value of maximum efficiency.	Apply	5,8
6	a) Compare the advantages and disadvantages of class-A (resistive load) and class-A (transformer load)power amplifiers. b) Compare the advantages and disadvantages of class-B push pull and class-B complementary symmetry power amplifiers.	Remember	5,8
7	a) Discuss about the distortion present in power amplifiers. Derive the expression for the total amount of distortion present in the amplifiers. b) Explain how even harmonic distortion can be reduced in a Class B push-pull configured amplifier c) Explain the origin of crossover distortion. Describe various methods to minimize this distortion.	Remember	5,8
8	a) A single stage class A amplifier V_{cc}=20V, V_{CEQ}=10V, I_{CQ}=600mA, R_L=16 Ω. The ac output current varies by 300mA, with the ac input signal. Calculate i) The power supplied by the dc source to the amplifier circuit. ii) AC power consumed by the load resistor. iii) AC power developed across the load resistor. iv) DC power wasted in transistor collector.	Analyze	5,8

S. No	Question	Blooms Taxonomy Level	Course Outcome
	v) Overall efficiency vi) Collector efficiency. b) Discuss about the following terms i) Thermal runaway and thermal stability in a power amplifier ii) Heat Sinks for power amplifiers.		
9	a) A push pull amplifier utilizes a transformer whose primary has a total of 160 turns and whose secondary has 40 turns. It must be capable of delivering 40W to an 8 Ω load under maximum power conditions. What is the minimum possible value of V_{cc}? b) For an ideal class B transistor amplifier the collector supply voltage Vcc and the effective load resistance $R^1_L = (N1/N2)^2$ RL are fixed as the base current excitation is varied. Show that the collector dissipation Pc is zero at no signal, rises as Vm increases and passes through a maximum at Vm = 2Vcc/π	Understand	5,8
10	10 a) A single ended class A amplifier has a transformer coupled load of 8 Ω. If the transformer turns ration is 10, find the maximum power output delivered to the load. Take the zero signal collector current of 500mA. (b) A transistor in a transformer coupled (Class - A) power amplifier has to deliver a maximum of 5Watts to a load of 4 load. The quiescent point is adjusted for symmetrical swing, and the collector supply voltage is VCC=20 Volts. Assume Vmin=0 volts. i. What is the transformer turns ratio? ii. What is the peak collector current? (c) Discuss how rectification may takes place in a power amplifier?	Remember	5,8
	UNIT-V **TUNED AMPLIFIERS**		
1	a) classify tuned amplifiers b) Mention the characteristics of tuned amplifiers.	Analyze	7,8
2	With neat diagram, explain the operation of single tuned capacitive coupled amplifier and derive expressions for voltage gain bandwidth. Make necessary assumptions and mention them.	Understand	7,8
3	With neat diagram, explain the operation of single tapped tuned amplifier and derive expressions for voltage gain bandwidth. Make necessary assumptions and mention them.	Analyze	7,8
4	With neat diagram, explain the operation of single tuned inductive coupled amplifier and derive expressions for voltage gain bandwidth. Make necessary assumptions and mention them.	Analyze	7,8
5	With neat diagram, explain the operation of double tuned amplifier and derive expressions for voltage gain bandwidth. Make necessary assumptions and mention them.	Apply	7,8
6	a) Compare single tuned capacitive coupled, tapped tuned, and inductive coupled amplifiers. b) Compare single tuned and double tuned amplifiers.	Apply	7,8
7	) Explain the operation of stagger tuned amplifiers.	Understand	7,8
8	(a) Differentiate between a tuned voltage amplifier and a basic voltage amplifier. Draw the circuits of both of them. Also draw their frequency responses? (b) Explain why tuned amplifiers cannot be used for amplification of low frequencies?	Remember	7,8
9	(a) State the functions and frequency ranges of operation of tuned amplifiers with relevant reasons? (b) Draw the circuit of a typical single tuned RF amplifier stage employing a transistor. If the tuned circuit contains L=200 _H,C=126pF, RL = 15k: Calculate the bandwidth of the amplifier?	Remember	7,8
10	A constant generator drives a parallel tuned circuit consisting of a loss less capacitor 'C' and a coil 'L' (having small resistance 'R'). Derive the expression for the frequency of resonance?	Analyze	7,8

Prepared By: Mrs. Deepthi.S, Mrs. Ajitha .G, Mrs. Shruthi .L, Mr. K Ravi

HOD, ECE