MUTHAYAMMAL ENGINEERING COLLEGE

(An Autonomous Institution)

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Rasipuram - 637 408, Namakkal Dist., Tamil Nadu

ECE

MKC

Must Know Concepts (MKC)

2021-22

Subject		19ECC03 - ANALOG ELECTRONICS		
Unit I		BJT AND FET AMPLIFIERS		
S.No	**Term**	**Notation (Symbol)**	**Concept/Definition/Meaning/Units/Equation /Expression**	**Units**
1.	Amplifier	-	An amplifier is an electronic device that increases the voltage, current, or power of a signal	-
2.	Type of Amplifier	-	Common Emitter, Common Base and Common collector amplifiers	-
3.	small-signal model	-	A small-signal model is an AC equivalent circuit in which is nonlinear circuit elements are replaced by linear elements	-
4.	Common Emitter	-	The most common amplifier configuration for an NPN transistor is that of the Common Emitter Amplifier circuit	-
5.	Common Base	-	Common Base Amplifier the input is applied to the emitter terminal while the output is taken from the collector terminal of the BJT transistor	-
6.	Common Collector	-	Common Collector Amplifiers produce an output voltage across its emitter load which is in-phase with the input signal	-
7.	Voltage gain	-	Voltage gain is nothing but the ratio of output voltage and input voltage.	-
8.	input impedance	-	It is also defined as the ratio of voltage across the input terminals to the current flowing through the input terminals.	-
9.	output impedance	-	Measure of the opposition to current flow to the electrical source.	-
10.	FET	-	The field-effect transistor is an electronic device which uses an electric field to control the flow of current.	-
11.	Types of FET	-	JFET,MOSFET	-
12.	Features of JFET	-	High input impedance, Low noise, Simple to fabricate	-
13.	Amplification	μ	Amplification factor (μ). It is the ratio of	-

	factor		change in drain source voltage (V_{DS}) to the change in gate source voltage (V_{GS}) at constant drain current.	
14.	Transconductance	-	For an FET, transconductance is the ratio of the change in drain current to the change in gate voltage.	-
15.	Types of MOSFET	-	Depletion mode, Enhancement mode MOSFET.	-
16.	I_{DSS} in FET	-	I_{DSS} (referred to as the drain current for zero bias) is the maximum current that flows through a FET transistor, when V_G=0.	-
17.	Pitch off voltage	-	Pinch off voltage is the drain to source voltage after which the drain to source current becomes almost constant and JFET enters into saturation region.	-
18.	Drain resistance	r_d	Drain resistance, rd. It is defined as the ratio of change in drain to source voltage to the change in drain current at a constant gate to source voltage.	-
19.	Application of JFET	-	Electronic switch, phase shift oscillator, RF amplifier in FM tuner, buffer in measuring instruments.	-
20.	Relation between FET parameters	-	Amplification factor = Drain resistance × Transconductance	-
21.	Application of MOSFET	-	Electronic voltmeters, Logic circuits, Computer memories and phase shift oscillator	-
22.	Normally on MOSFET	-	The depletion mode MOSFET can conduct even if the gate source voltage is zero.	-
23.	Transconductance	-	For an FET, transconductance is the ratio of the change in drain current to the change in gate voltage.	-
24.	Signal Analysis	-	To collect, understand, and deduce information and intelligence from various signals.	-
25.	Common Gate amplifier	-	a common-gate amplifier is one of three basic single-stage field-effect transistor amplifier topologies, typically used as a current buffer or voltage amplifier.	-
UNIT II IC AND DIFFERENTIAL AMPLIFIERS				

26.	Biasing Stability	-	The collector to base feedback configuration ensures that the transistor is always biased in the active region regardless of the value of Beta (β). The DC base bias voltage is derived from the collector voltage V_C, thus providing good stability.	-
27.	Transistor Biasing	-	The goal of Transistor Biasing is to establish a known quiescent operating point, or Q-point for the bipolar transistor to work efficiently and produce an undistorted output signal.	-
28.	Types of Biasing	-	Fixed Bias Collector to Base Bias Self biasing	-
29.	Thermal Runaway	-	The self-destruction of such an unstablized (Temperature) transistor is known as Thermal run away.	-
30.	Need for Biasing	-	Transistor biasing is the process of setting a transistors DC operating voltage or current conditions to the correct level so that any AC input signal can be amplified correctly by the transistor.	-
31.	Stabilization	-	The process of making the operating point independent of temperature changes or variations in transistor parameters is known as Stabilization.	-
32.	Need for Stabilization	-	• Temperature dependence of I_C • Individual variations • Thermal runaway	-
33.	Constant current sources	-	Constant current sources are a very simple way of forming biasing circuits or voltage references with a constant value of current	-
34.	Current mirror	-	A current mirror is a circuit designed to copy a current through one active device by controlling the current in another active device of a circuit	-
35.	Cascode Amplifier	-	The cascode is a two-stage amplifier that consists of a common-emitter stage feeding into a common-base stage	-
36.	Differential Amplifier	-	Amplifies the difference between two input voltages but suppresses any voltage common to the two inputs	-
37.	CMRR	-	Defined as the ratio of differential voltage gain to common mode voltage gain	-
38.	Need of differential amplifier	-	There will be no output voltage resulting from thermal drifts or any other changes provided, changes in both halves of the circuits are equal.	-
39.	Need for constant current	-	The necessary for constant current source for differential amplifier to increase the common	-

	source for difference amplifier		mode rejection ratio without changing the quiescent current and without lowering the forward current gain.	
40.	Special features of a difference amplifier that used FETs	-	a. Very high input impedance. b. The common mode rejection ability is increased which makes the common gain almost zero.	-
41.	Various methods of improving CMRR	-	a. Constant current bias method b. Use of current mirror circuit c. Use of active load	-
42.	Frequency response of Amplifier	-	It can be defined as a graph drawn between the input frequency and the gain of an amplifier.	-
43.	Lower cut-off frequency	-	The frequency (on lower side) at which the voltage gain of the amplifier is exactly 70.0% of the maximum gain is known as lower cut off frequency.	-
44.	Upper cut-off frequency	-	The frequency (on higher side) at which the voltage gain of the amplifier is exactly 70.0% of the maximum gain is known as upper cut off frequency.	-
45.	Bandwidth	-	The range of frequencies occupied by the signal is known as its bandwidth.	-
46.	Electrolytic capacitor is not used for coupling	-	Electrolytic capacitor is a polarized capacitor. So it cannot be used for coupling	-
47.	Effects of coupling capacitor	-	a.The coupling capacitor transmits AC Signal. But blocks Dc. This prevents DC interferences between various stages and the shifting of operating point. b. It prevents the loading effect between adjacent stages.	-
48.	Dynamic range of an amplifier	-	The range over which an active electronic device can produce a suitable output signal in response to an input signal.	-
49.	Current steering circuit	-	In IC a constant dc current called a reference current is generated at one location and is then replicated at various other locations for biasing the various amplifier stages through a process known as current steering.	-
50.	relation between Io and Iref	-	$\frac{I_O}{I_{REF}} = \frac{(W/L)_2}{(W/L)_1}$	-
UNIT III FEEDBACK AND OSCILLATORS				

51.	Feedback Amplifier	-	Feedback Amplifier is a device that is based on the principle of feedback. The process by which some part or fraction of output is combined with the input is known as feedback.	-
52.	Different types of feedbacks used in amplifier circuits	-	1. Positive feedback 2. Negative feedback	-
53.	Advantages of negative feedback	-	• Stability of gain is improved • Reduction in distortion • Reduction in noise • Increase in input impedance • Decrease in output impedance	-
54.	Positive feedback	-	The feedback signal is in phase with input signal, then the net effect of the feedback will increase the input signal given to the amplifier. This type of feedback is said to be positive or regenerative feedback.	-
55.	Negative feedback	-	The feedback signal is out of phase with the input signal then the input voltage applied to the basic amplifier is decreased and correspondingly the output is decreased. This type of feedback is known as negative or degenerative feedback.	-
56.	Properties of negative feedback	-	i.Negative feedback reduces the gain ii. Distortion is very much reduced	-
57.	Node sampling	-	When the output voltage is sampled by connecting the feedback network in shunt across the output, the connection is referred to as voltage or node sampling.	-
58.	Loop sampling	-	When the output current is sampled by connecting the feedback network in series with the output, the connection is referred to as current or loop sampling.	-
59.	Sensitivity	-	The ratio of percentage change in voltage gain with feedback to the percentage change in voltage gain without feedback.	-
60.	Loop gain or Return ratio	-	A path of a signal from input terminals through basic amplifier, through the feedback network and back to the input terminals forms a loop. The gain of this loop is the product $-A\beta$.	-
61.	Feedback factor or Feedback ratio.	-	The ratio of the feedback voltage to output voltage	-

62.	Four basic feedback topologies	-	1. Voltage amplifier with voltage series feedback. 2. Transconductance amplifier with current-series feedback. 3. Current amplifier with current-shunt feedback 4. Transresistance amplifier with voltage shunt feedback	-
63.	Gain of an amplifier with feedback	-	$Avf = AV/ 1+ AV \beta$	-
64.	Example for voltage-series feedback	-	The Common collector or Emitter follower amplifier.	-
65.	Nyquist Diagram	-	The plot which shows the relationship between gain and phase-shift as a function of frequency	-
66.	Oscillator	-	A circuit with an active device is used to produce an alternating current is called an oscillator circuit.	-
67.	Damped and Undamped Oscillation	-	**Damped Oscillation:** The electrical Oscillations in which the amplitude decreases with time **Undamped Oscillation:** The electrical oscillations in which amplitude does not change with time are called as sustained oscillations. It is also called as undamped Oscillation.	-
68.	Barkhausen criterion for an oscillator	-	1. The total phase shift around a loop, as the signal proceeds from input through amplifier, feedback network back to input again, completing a loop, is precisely 0 or 360 . 2. The magnitude of the product of the open loop gain of the amplifier (A) and the feedback factor β is unity. i.e., $A \beta = 1$.	-
69.	Multivibrator	-	The electronic circuits which are used to generate nonsinusoidal waveforms are called Multivibrators.	-
70.	Types of Multivibrators	-	Bistable Multivibrator, Monostable Multivibrator,Astable Multivibrator	-
71.	Other names of monostable Multivibrator	-	One-shot, Single-shot, a single-cycle, a single swing, a single step Multivibrator, Univibrator.	-
72.	Types of feedback oscillators	-	RC-Phase shift Oscillator, LC-Oscillators	-
73.	Stability of an Oscillator.	-	The frequency stability of an Oscillation is a measure of its ability to maintain the required frequency as precisely constant as possible over a long period of time interval.	-

74.	Advantages of RC phase shift oscillator	-	Simplicity of the circuit. Useful for frequencies in the audio range. A sine wave output can be obtained.	-
75.	Applications of oscillators	-	a) As a local oscillator in radio receivers. b) In T.V receivers. c) In signal generators. d) As clock generation for logic circuits. e) AM and FM transmitters. f) In phase lock loops.	-
UNIT IV TUNED AMPLIFIERS				
76.	Tuned amplifiers	-	The amplifiers which amplify only selected range of frequencies (narrow band of frequencies) with the help of tuned circuits (parallel LC circuit) are called tuned amplifiers.	-
77.	Classification of tuned amplifiers	-	Single tuned, Double tuned ,Stagger tuned	-
78.	Advantages of tuned amplifiers	-	They amplify defined frequencies. Signal to noise ratio at output is good They are suited for radio transmitters and receivers	-
79.	Characteristics of an ideal tuned amplifier	-	1.Selects a single radio frequency and amplifiers the same by rejecting all other frequencies.2.Bandwidth is zero.3. Harmonic distortion is zero.	-
80.	Application of tuned amplifiers	-	The application of tuned amplifiers to obtain a desired frequency and rejecting all other frequency in 1.Radio and T .V broadcasting as tuning circuit.2. Wireless communication system	-
81.	Q factor	-	It is the ratio of reactance to resistance. It also can be defined as the measure of efficiency with which inductor can store the energy.	-
82.	Stagger tuned amplifiers	-	Stagger tuned amplifiers use a number of single tuned stages in cascade, the successive tuned circuits being tuned to slightly different frequencies.	-
83.	Synchronously tuned amplifier	-	When tuned amplifiers are cascaded if all the amplifier stages are identical and tuned to same frequency fo then it is called as synchronously tuned amplifier. This results in a increased in gain and reduction in bandwidth.	-
84.	Single tuned amplifier	-	An n amplifier circuit that uses a single parallel tuned circuit as a load	-
85.	Double tuned amplifiers	-	The amplifiers having two parallel resonant circuit in its load are called double tuned amplifiers	-
86.	Unloaded Q	-	It is the ratio of stored energy to the dissipated energy in a reactor or resonator	-

87.	Neutralization	-	The technique used for the elimination of potential oscillations is called neutralization	-
88.	Disadvantages of tuned amplifiers	-	The circuit is bulky and costly The design is complex. They are not suited to amplify audio frequencies	-
89.	Cascode amplifier	-	The cascode is a two-stage amplifier that consists of a common-emitter stage feeding into a common-base stage.	-
90.	cascade amplifier	-	A cascade amplifier is any two-port network constructed from a series of amplifiers, where each amplifier sends its output to the input of the next amplifier.	-
91.	Cascode amplifier charact eristics	-	High gain, moderately high input impedance, a high output impedance, and a high bandwidth	-
92.	Multistage amplifiers	-	cascading number of amplifier stages known as multistage amplifier.	-
93.	Other name for tuned amplifier	-	Used for amplifying narrow band of frequencies hence it is also known as “narrow band amplifier” or “Band pass amplifier”.	-
94.	Performance measure of a tuned amplifier	-	Selection of a desired radio frequency signal. • Effective quality factor. • Gain • Bandwidth.	-
95.	Quality factor	-	Q = XL / R.	-
96.	Ideal tuned amplifier	-	Selects a single radio frequency and amplifiers the same by rejecting all other frequencies. Bandwidth is zero. Harmonic distortion is zero.	-
97.	Relationship between bandwidth and effective Q		Bandwidth = ωo / Q effective	-
98.	Methods of coupling		Capacitive coupling, Inductive coupling.	-
99.	Frequency range		For low frequencies the size L and C are large. So the circuit will be bulky and expensive, hence the tuned amplifiers cannot be used at low frequency.	-
100.	Drawbacks of a single tuned amplifier		Narrow bandwidth on smaller pass band, which will result in poor production of the audio signal. The sides (and the top) of a gain versus frequency curve are not steeper.	-

Unit V POWER AMPLIFIERS				
101.	Power Amplifier	-	a)An amplifier is an electronic device that increases the voltage, current, or power of a signal b) Depending on the changes it makes to the input signal, amplifiers are broadly classified into Current, Voltage and Power amplifiers.	-
102.	Type of Power Amplifiers (Based on Mode of Operation)	-	class A, class B, class AB and class C Amplifiers.	-
103.	Class A Amplifier	-	A single transistor is used to amplify both the positive and negative halves of the waveform.	-
104.	Class B Amplifier	-	This class of amplifiers uses two complementary transistors. One transistor amplifies positive half of the waveform and the other amplifies negative half of the waveform.	-
105.	Class AB Amplifier	-	combination of class A and class B amplifiers	-
106.	Class C Amplifier	-	Class C amplifiers generally contain a tuned load which filters and amplifies input signals	-
107.	Type of Power Amplifiers (Based on Frequencies)	-	a)Audio Power Amplifiers − The audio power amplifiers raise the power level of signals that have audio frequency range (20 Hz to 20 KHz). b)Radio Power Amplifiers − Radio Power Amplifiers or tuned power amplifiers raise the power level of signals that have radio frequency range (3 KHz to 300 GHz).	-
108.	Conduction angle	-	Class A Amplifier -360° Class B Amplifier -180° Class AB Amplifier-180° to 360° Class C Amplifier - less than 180°	-
109.	Efficiency	-	Class A Amplifier - 50% Class B Amplifier -78.5% Class C Amplifier - 100%	-
110.	Maximum peak to peak voltage	-	Class A Amplifier – MPP < VCC Class B Amplifier - MPP = VCC Class C Amplifier - MPP = 2 (VCC)	-
111.	Linearity	-	Class A Amplifier – High Class B Amplifier - Low Class C Amplifier - Poor	-
112.	Distortion	-	Class A Amplifier – Low Class B Amplifier - Moderate	-

			Class C Amplifier - High	
113.	Class A Amplifier uses	-	Low power amplifiers where efficiency is not important	-
114.	Class B Amplifier uses	-	Output power amplifiers	-
115.	Class C Amplifier uses	-	Tuned RF amplifiers but cannot be used as audio amplifiers due to high distortion	-
116.	Large signal amplifier	-	It is also known as power amplifiers whose main aim is to deliver a substantial amount of power to a load.	-
117.	Applications of power amplifier	-	a. Used in radio and TV transmitters. b. Used to amplify the high frequency signals. c. Tuned amplifiers	-
118.	Classifications of Class A amplifier	-	1. Direct coupled Class A amplifier. 2. Transformer coupled Class A amplifier.	-
119.	class A amplifier	-	In class A amplifier, the transistor is ON for the full cycle of the input AC signal.	-
120.	class C amplifier	-	Class C In this mode, the level current flows for less than one half cycled i.e., ¼ th of the input cycle.	-
121.	class AB amplifier	-	Class AB In this mode of operation, the output current flows for more than one half cycle but less than full cycle.	-
122.	Frequency distortion	-	the signal components at different frequencies are amplified by different amount	-
123.	Heat sink	-	It is a large, finned, black metallic heat conducting device placed in close contact with the transistor case	-
124.	Push pull amplifier	-	A push–pull amplifier is a type of electronic circuit that uses a pair of active devices that alternately supply current to, or absorb current from, a connected load.	-
125.	class D amplifier	-	A class-D amplifier or switching amplifier is an electronic amplifier in which the amplifying devices (transistors, usually MOSFETs) operate as electronic switches	-
PLACEMENT ORIENTED QUESTIONS				

126	Electronics	-	Study and use of electrical devices that operate by controlling the flow of electrons or other electrically charged particles.	-
127	Communication	-	Transferring of message from one place to another place	-
128	Types of communications	-	Analog and digital communication.	-
129	Diode	-	Two-terminal device, unidirectional current property	-
130	Transistor	-	Semiconductor device commonly used to amplify or switch electronic signals	-
131	Resistor	-	Two-terminal electronic component that opposes an electric current by producing a voltage drop between its terminals in proportion to the current	-
132	Inductor	-	Inductor is a passive electrical device employed in electrical circuits for its property of inductance.	-
133	Conductor	-	A substance, body, or device that readily conducts heat, electricity, sound, etc. Copper is a good conductor of electricity.	-
134	Semi conductor	-	A semiconductor is a solid material that has electrical conductivity in between that of a conductor and that of an insulator	-
135	Negative feedback and positive feedback	-	-ve feedback is ---Amplifiers And for +ve feedback is Oscillators	-
136	Feedback	-	Process whereby some proportion of the output signal of a system is passed (fed back) to the input.	-
137	Bias	-	The application of electric voltage to a P-N junction is known as Bias.	-
138	Clock	-	A clock is started at noon. By 10 minutes past 5, the hour hand has turned through: Ans : 155°	-
139	Time and Work	-	A can lay railway track between two given stations in 16 days and B can do the same job in 12 days. With help of C, they did the job in 4 days only. Then, C alone can do the job in: Ans : 9 3/5 Days	-
140	Problems on Ages	-	A is two years older than B who is twice as old as C. If the total of the ages of A, B and C be 27, then how old is B Ans : 10	-
141	Problems on	-	The sum of ages of 5 children born at the intervals of 3 years each is 50 years. What is	-

	Ages		the age of the youngest child? Ans : 4 years	
142	Profit and Loss	-	In a certain store, the profit is 320% of the cost. If the cost increases by 25% but the selling price remains constant, approximately what percentage of the selling price is the profit? Ans : 70%	-
143	Speed and Distance	-	A boy runs 200 metres in 24 seconds. What is his speed ? Ans : 20 km/hr	-
144	Percentages	-	What percent is 2 minutes 24 seconds of an hour Ans : 4%	-
145	Numbers	-	$(112 \times 5^4) = ?$ Ans : 70000	-
146	Profit and Loss	-	A vendor bought toffees at 6 for a rupee. How many for a rupee must he sell to gain 20% Ans : 5	-
147	Simplification	-	In a regular week, there are 5 working days and for each day, the working hours are 8. A man gets Rs. 2.40 per hour for regular work and Rs. 3.20 per hours for overtime. If he earns Rs. 432 in 4 weeks, then how many hours does he work for ? Ans : 175	-
148	Simplification	-	A man has some hens and cows. If the number of heads be 48 and the number of feet equals 140, then the number of hens will be: Ans : 26	-
149	Problems on Trains	-	A train 125 m long passes a man, running at 5 km/hr in the same direction in which the train is going, in 10 seconds. The speed of the train is: Ans : 50 km/hr	-
150	Simple Interest	-	A sum fetched a total simple interest of Rs. 4016.25 at the rate of 9 p.c.p.a. in 5 years. What is the sum? Ans : 8925	-

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