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|  | **UNIT IV - LARGE SIGNAL AMPLIFIERS (or) POWER AMPLIFIER** |  |  |  |
| 1. List out the classification of large signal amplifiers? | |  |  |
| The large signal amplifiers are classified as follows. | | |  |
| a. Based on the input | |  |  |
| i. | small signal amplifiers | . | |  |
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| ii. | large signal amplifiers |  |  |  |
| b. Based on the output | |  |  |  |
| I. | Voltage amplifier |  |  |  |
| II. | Power amplifier |  |  |  |
| III. | Current amplifier |  |  |  |
| c. Based on the transistor configuration | | | |  |
| . | |  |  |  |
| I. | CE amplifier |  |  |  |
| II. | CB amplifier |  |  |  |
| III. | CC amplifier |  |  |  |
| d. Based on the number of stages | |  |  |  |
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| I. | Single stage amplifier |  |  |  |

* 1. Multistage amplifier e. Based on the Bandwidth
  2. Untuned amplifier (wide band amplifier)
  3. Tuned amplifier (narrow band amplifier) f. Based on the frequency response
  4. AF (Audio frequency) amplifier

II. IF (Intermediate frequency) amplifier

* 1. RF (Radio Frequency) amplifier g. Based on the Biasing condition
  2. Class A amplifier

II. Class B amplifier

III. Class C amplifier

IV. Class AB amplifier

V. Class D amplifier

VI. Class S amplifier

2. How do you bias the class A operation?

In class A mode, the output current flows through out the entire period of input cycle and the Q point is chosen at the midpoint of AC load line and biased.

3. Which amplifier gives minimum distortion?

Class S amplifier gives minimum distortion.

4. Give the applications of class C power amplifier.

The applications of class C power amplifier are, a. Used in radio and TV transmitters.

b. Used to amplify the high frequency signals. c. Tuned amplifiers

5. Give the two draw backs of class C amplifier. The drawbacks of class C amplifier are,

a. Distortion is high.

b. Figure of merit is low.

6. Define the following modes of operation (a) Class AB (b) Class C. a. Class AB

In this mode of operation, the output current flows for more

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| than one half cycle but less than full cycle. |  |  |
| b. Class C |  |
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| In this mode, the level current flows for less than one half | |  |
| cycled i.e., ¼ th of the input cycle. |  |  |

7. Define Class B modeofoperationanditsadvantagesanddisadvantages. Class B mode.ofoperation

The Biasing signal and input signal flow through the circuit for half cycle i.e., 180o.

Advantages

a. Efficiency is increased from 25% to 78.5%

b. Due to push pull configuration all even harmonics are reduced. So harmonic distortions are reduced.

c. Due to centre-tapped transformer at input and output, the core saturation loss is reduced.

Disadvantages

* 1. Transistor is biased above the cut off region
  2. Due to the centre-tapped transformer at both input and output, the circuit becomes complex

1. What is Class D amplifier?

In order to increase the conversion efficiency, it would be desirable to make the device to operate as a switch. So that its voltage drop remains almost at minimum value over the half cycle of output current flow. Such a system is called class D amplifier.

1. State the merits of using push pull configuration.
2. The merits of push pull configurations are,
   1. Efficiency is high (78.5%)
   2. Figure of merit is high
   3. Distortion is less.
   4. Ripple present in the output due to power supply is multiplied.

10.What are the advantages of using complementary symmetry configuration?

The advantages of using complementary symmetry configuration are,

1. It does not use centre-tapped transformer either at input or output.
2. It uses one PNP transistor and one NPN transistor hence it provides proper impedance matching. Hence its voltage gain is unity.

11.Define conversion efficiency of a power stage.

The ratio of the AC output power delivered to the load to DC input power applied is referred to as conversion efficiency. It is also called as collector circuit efficiency in case of transistor amplifier.

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| Signal power delivered to the load x 100 |  |  |
| = DC Power supplied at input circuit |  |  |
| 12.Write down the values of maximum possible power conversion efficiency | |  |
| for class A direct coupled and transformer coupled. |  |  |
| For class A direct coupled = 25% | . |  |
|  |  |
| For class A transformer coupled = 50% |  |  |

13. What is cross l over distortion?

In class.Bmode both transistors are biased at cut off region because the DC bias voltage is zero. So input signal should exceed the barrier voltage to make the transistor conduct. Otherwise the transistor doesn’tconduct. So there is a time interval between positive and negative alternations of the input signal when neither transistor is conducting. The resulting distortion in the output signal is cross over distortion.

14.How cross over distortion is eliminated?

To avoid cross over distortion, a light forward bias (0.3Vfor ge 0.6V for Si) voltage is applied to the emitter junction of both the transistors. It causes transistor to conduct immediately when the input signal is applied. So Q point is fixed above cut off.

15.What are the drawbacks of the transformer coupled amplifier? The disadvantages of transformer-coupled amplifiers are,

a. Transformer are bulky

b. Loss is more c. Centre-tapped of transformer is difficult.

16. Why RC coupling is popular?

RC coupling is popular because it is simple, less expensive, less distortion and it provides uniform bandwidth.

17.List the advantages of transformer coupled amplifier. The advantages of transformer coupled amplifier are,

1. it is more efficient because the low DC resistance of the primary is connected to the collector circuit.
2. It provides excellence impedance matching, thus voltage and power gains are improved.

18.What is the use of transformer coupling in the output stage of multistage amplifier?

The transformer coupling provides impedance matching between input and output. As a result the power gain is improved.

19.State the reason for fall in gain at low frequencies in the RC coupled amplifier.

1. The coupling capacitance (input) has very reactance at low frequency. Therefore it will allow only a small part signal from one stage to next stage.
2. The bypass capacitor cannot bypass or shunt the emitter resistor effectively.

As a result of these factors, the voltage gain rolls off at low frequency.

20.State the reason for fall in gain at high frequencies.

At high frequency, the reactance of coupling capacitor (output) is

very low. Therefore it provides like a short circuit. As a result of this, the

loading effect of the next stage increase which reduces the voltage gain.

Hence the voltage gain falls off at high frequencies.

21.What is amplitude or non linear distortion?

In case of large signal amplifier, the input signals are large in amplitude. So the operation extends to non linear region of its transfers

characteristics. Of the signal excursion enters the non-linear region then distortion occurs in the output. Such a distortion is called non-linear distortion.

22.Define figure of merit.

Figure of merit is defined as the ratio of maximum collector current dissipation power to the maximum AC power developed across the load.

23.Where S amplifiers are used?

The class S power amplifier can be used to amplify either the constant amplitude or varying amplitude signal such as FM or AM signal.

24. Define inter modulation distortion?

Inter modulation distortion is a type of non-linear distortion. Which generate frequency components not harmonically related to the signal frequencies. It occurs when the input signal contains more than the one frequency.

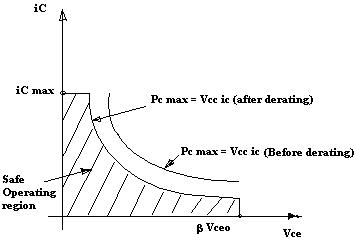
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25.What is the use of heat sink?

The heat sink is used to observe the heat produce in the transistor junctions while its operation. Usually power amplifiers are provided with heat sinks. The heat sink is a large, black metallic heat-conducting device placed in close contact with the transistor.

26.What is the maximum power dissipation hyperbola?

Maximum power dissipation hyperbola represents focus of all the points at which the collector dissipation is exactly Pc Max . The Q point must lie on or below the hyperbola for safe operation.



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| 27. Define thermal resistance. |  |  |
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| The resistance offered by the bipolar junction transistor to the | |  |
| flow of heat is called thermal resistance. |  |  |

The thermal resistance Q = QjA = QjC+QCS+QSAo C/W

QjA = Total junction to ambient thermal resistance

.QjC=Junction to case thermal resistance. QCS= Case to heat sink resistance.

Q =Heat sink to ambient resistance.

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28.Write the maximum power handling of the class C power amplifier? The maximum power in class C power amplifier is,

Pc max = 5/12 (T/To)(Vcc2/RL)

29.Write the advantages of heat sink? The advantages of heat sink are,

1. The temperature of the case gets lowered.
2. The power handling capacity of the transistors can approach the rapid maximum value.

30.Write the derating factor expression of a power transistor?

Pd(T1) = Pd(To) – (T1 - To)

Where Pd(To) = Rated power handling capacity at To Pd(T1) = Power handling capacity at T1

The derating factor is expressed in the units of watts / degree of temperature or milliwatts /degree of temperature.

31.What is meant by thermal analogy of power transistors?

The heat dissipation problem is very much analogous to a simple electric circuit and the ohm’s law. An electric current flows when there exists a potential difference while the heat flows when there exists a temperature difference (T2-T1).

32.Write the Thermal-electric analogy parameters.

The following are the thermal-electric analogy parameters. Tj = Junction temperature

TC = Case temperature

TA = Ambient temperature QjA = Total thermal resistance

QjC= Transistor thermal resistance. QCS= Insulator thermal resistance. QSA=Heat sink thermal resistance.