53 (EC 301) ELDC

2014

ELECTRONICS DEVICES & CIRCUITS

Paper : EC 301

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

Answer ***any Five*** *questions out of* ***Eight*** *questions.*

1. *(a)* Describe the graphical method and calculate the gain of the transistor amplifier by using both DC and AC load line. 7

   (b) Explain the characteristic comparison between CE, CB and CC amplifiers. 6

   (c) Compare the analysis of a transistor amplifier using H-parameters between common emitter amplifier and common-base amplifier. 7

2. *(a)* With the help of diagram calculate and explain the voltage gain, input impedance and output impedance of Common Drain (CD) amplifier. 10

(b) Point out the difference between voltage amplifier and power amplifier. Also give the characteristic comparison between the same. 10

3. *(a)* Explain Class A push-pull power amplifier and point out the difference of two collector currents. 10

(b) For a source follower JFET amplifier, $R_g = 230M\Omega$, $R_s = 12 \cdot 5K\Omega$ and $g_m = 800\mu sec$. Assuming infinite input resistance and neglecting FET output resistance, calculate voltage gain, input resistance and output resistance of the amplifier. 5

(c) A Class B push-pull amplifier must deliver 20*watt* of audio-power to the output load *(i)* if the output transformer is 80% efficiency, what is the minimum power drain on the power supply under optimum conditions and *(ii)* what is the minimum average dissipation rating required for each transistor ? 5

4. *(a)* Describe the necessity of a tuned amplifier over a certain frequency amplifiers. 5

(b) Explain the frequency response curve of Double tuned amplifier. Also point out the use of double tuned over single tuned amplifier. 9

(c) Explain the efficiency of Class B amplifier and point out that why Class B operation is more efficient than Class A operation. 6

5. *(a)* A voltage amplifier has a gain of $-10\frac{V}{mv}$; express in *dB*.

(b) CE–CC cascade is advantageous than CE–CE cascade in terms of which parameter ?

(c) DC Coupled amplifiers are better than RC Coupled amplifier for integrated circuits application ; why ?

(d) If Quiescent collector current increased by a factor of 2 then what happens to the transconductance of a BJT.

(e) Write the expression for collector current that includes Farey effect and draw the corresponding small signal model for BJT.

(f) Draw the high frequency model of a BJT.

(g) Gain of an amplifier falls at high frequencies. Why ?

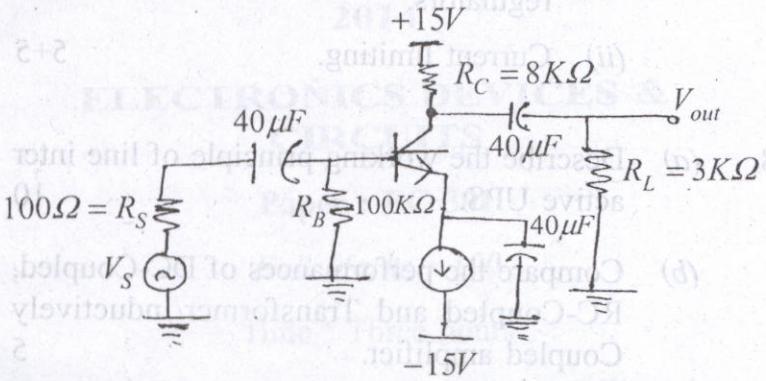
(h) Out of CE, CB and CC configuration of amplifier topologies, which configuration is suitable for current amplification purpose and why ?

(i) Mention *four* specifications of a voltage regulator IC.

(j) What is the interactive UPS ? 10×2=20

6. (a) Describe the operation of a Buck boost regulator with proper circuit diagram and find the expression for Duty cycle. 10

(b) Find (i) the gain of the amplifier circuit shown below.



(ii) Find the input resistance

(iii) Find the output resistance. 4+4+2

7. (a) Two non-ideal voltage amplifiers having ; input resistance R_{in_1} , R_{in_2} , output resistances R_{out_1} , R_{out_2} , gains AV_1, AV_2 ; are cascaded and is driven by a non-ideal voltage source having source resistance R_S . The cascaded amplifier drives load R_L ;

(i) Find the expression for over all voltage gain.

(ii) How interstage coupling effect can be eliminated ? 6+4

(b) Write short notes on :

(i) Short circuit protection for voltage regulators.

(ii) Current limiting. 5+5

8. (a) Describe the working principle of line inter active UPS. 10

(b) Compare the performances of DC-Coupled, RC-Coupled and Transformer/Inductively Coupled amplifier. 5

(c) Find the expression for short circuit current gain of an *n-p-n* transistor in saturation. 5