53 (EC 301) ELDV

2016

ELECTRONIC DEVICE AND 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 from **Eight** questions.*

1. *(a)* An CE Amplifier biased at $1mA$ collector current, uses a transistor having $\beta = 100$, has a voltage gain of $-20\frac{V}{V}$; output resistance of 20Ω; input resistance of $20k\Omega$. This amplifier is connected between a source of $10mV_{p-p}$ signal having source resistance 200Ω and a load of 12Ω speaker.

   (i) Calculate the input signal level at the input of the amplifier.

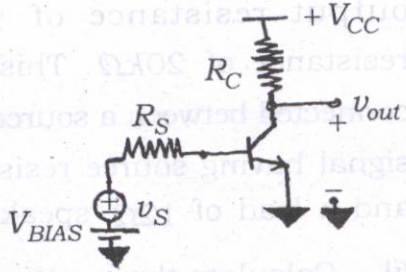
(ii) Calculate the open circuit voltage of output of the amplifier.

(iii) Calculate voltage level across the load. 2+1+2

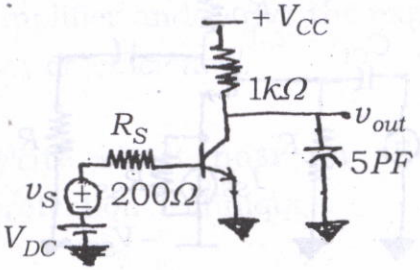
(b) Derive the expression for the resistance looking into the node '*y*' marked in the figure below (assume the transistor is in Active mode and properly biased). 5

*Fig.*1

(c) Derive the expressions for open-circuit voltage gain, input resistance and output resistance for the amplifier circuit shown below. (*Fig.*2) 6+2+2



2. *(a)* Calculate $-3db$ frequency of the amplifier shown below. Transistor has $\beta = 100$ & DC collector current of $1{\cdot}3\,mA$ and parasitic capacitances $C_\pi = 10\,PF$ & $C\mu = 1\,pF$

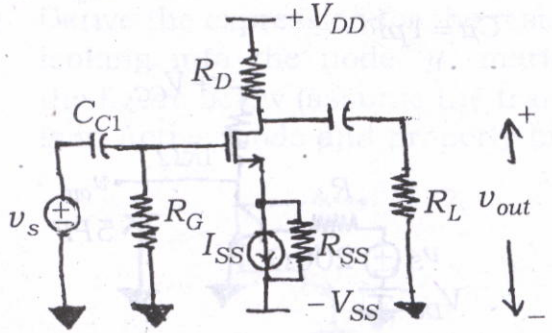


6

(b) Compare the performances of linear and switching regulators and describe the operation of Boost regulator with duty cycle (D). 4+6

(c) Write down the features of CE-CC cascaded amplifier and draw the small signal equivalent of the complete amplifier. 2+2

3. *(a)* Find the expressions for open circuit voltage gain, input resistance and output resistance for the following circuit



7+3+3

(b) Describe the operation of a Series Regulator with a pass transistor with proper circuit diagram and mention the need of current protection techniques. 5+2

4. *(a)* Describe the online UPS with proper circuit diagram and mention its merits and demerits. 6+4

(b) Describe the operation of emitter follower as a class-A Amplifier and derive the efficiency. 6+4

5. (a) Describe the operation of class-B amplifier and derive the expression for power efficiency. 5+5

(b) Write short note on short-circuit protection techniques. 5

(c) Describe the operation of offline UPS. 5

6. (a) Explain why tuned circuit is used in the electronic circuit devices. Also point out the difference between small signal tuned amplifier and large signal tuned amplifier. 6+4

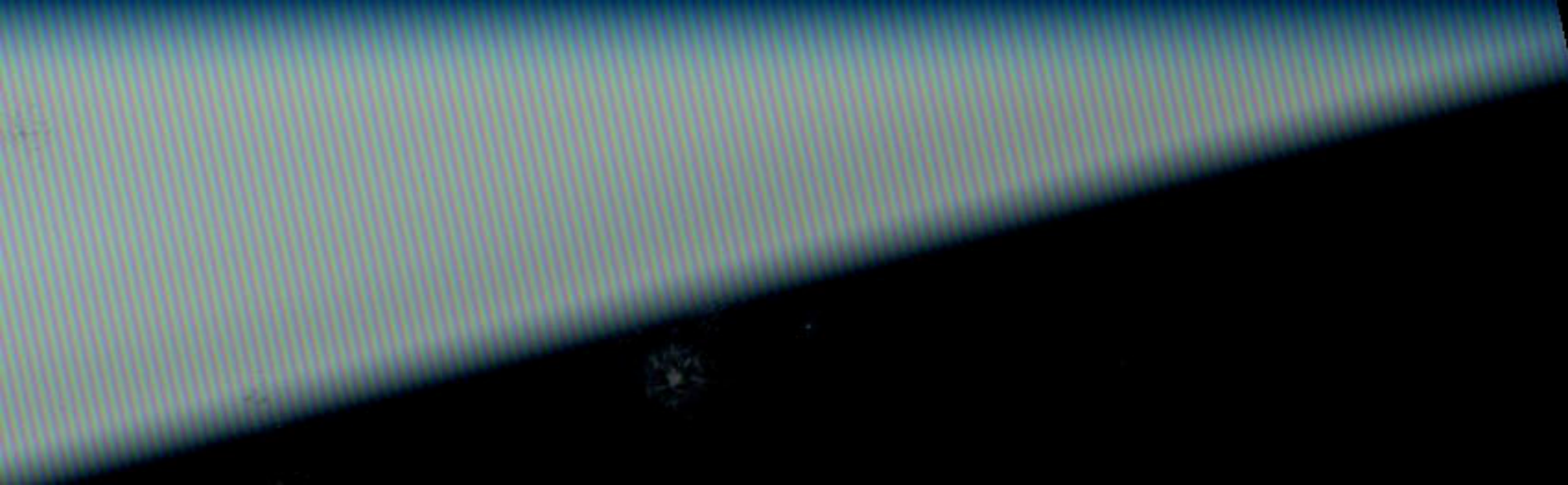
(b) Explain the working principle of parallel tuned circuit along with its proper diagram in details. 10

7. *(a)* Define Quality factor and Bandwidth of the tuned circuit with its proper curves. 10

(b) A circuit is resonant at 389 *kHz and* has a 20*kHz* bandwidth. The inductive reactance is 1277Ω. What is the parallel impedance of the circuit at resonance ? 5

(c) Explain the function of resistance connected in series with the inductive reactance in the parallel tuned circuit and compare it with the Quality factor *Q*. 5

8. *(a)* Describe the circuit operation of the single tuned amplifier along with its proper diagram. 8

(b) Explain tuned amplifier with capacitor coupled load along with its proper diagram. 6

(c) Explain the circuit operation of the inductively coupled load with tuned primary along with its circuit diagram. 6