53 (EC 301) ELDC

2013

(December)

ELECTRONIC DEVICES & CIRCUITS

Paper : EC 301

Full Marks : 100

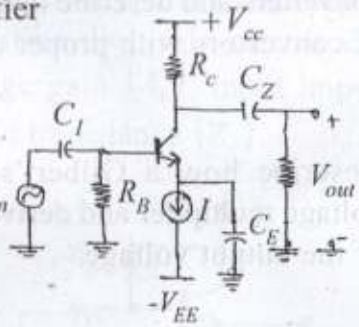
Pass Marks : 30

Time : Three hours

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

*Answer **any five** questions.*

1. *(a)* Given the circuit diagram below is of an Amplifier

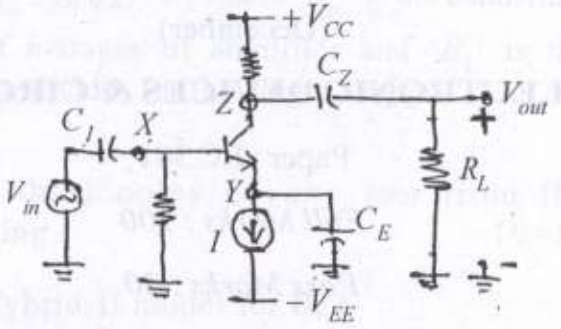


(i) Find expression for voltage gain

(ii) Write the expression for terminal voltages at each of the terminal. 5+5

Contd.

(b) The circuit shown below is assumed to be biased properly for amplification purpose.

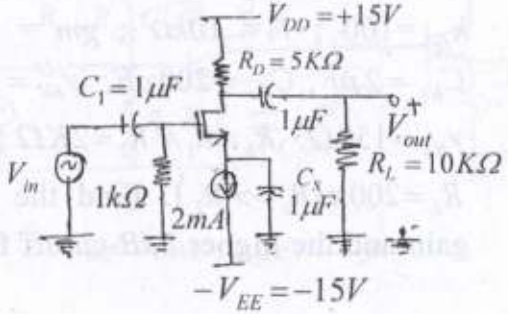


Find the resistance looking into the terminals mentioned as node *X*, *Y* & *Z*. 3+4+3

2. (a) Mention various types of *DC-DC* converters and describe the buck boost-type of convertors with proper circuit diagram. 10

(b) Describe how a Gilbert's cell works as voltage multiplier and derive the expression of the output voltage. 10

3. *(a)* Shown below is a Common Source Amplifier. 10

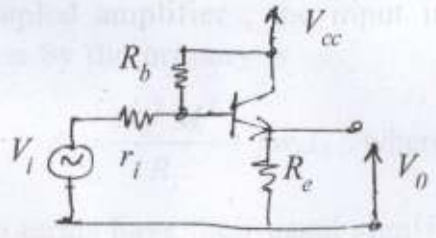


Find value of voltage gain, Input impedance and output impedance. Given

$$\mu\eta C_{ox}\frac{W}{L} = 1^{mA}/_{v^2}$$

$\lambda = 0.1\,v^{-1}$ and $V_{TH} = 1V$. 10

(b) The given circuit is a common collect *(CC)* amplifier. For this circuit calculate the voltage gain (A_v), input impedance (Z_i), output impedance (Z_o). 6+2+2



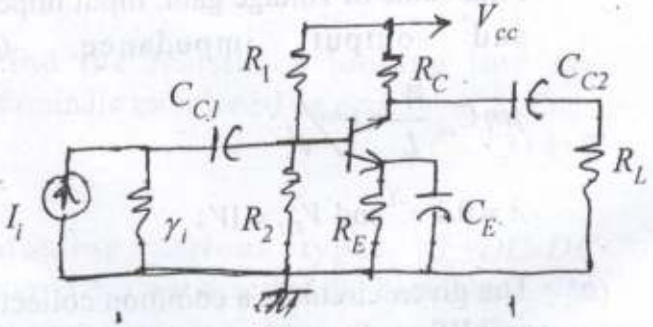
4. *(a)* The amplifier shown below has the following parameter : $V_{cc} = +12V$;

$h_{fe} = 100$; $\gamma_i = 10k\Omega$; $gm = 50mA/V$;

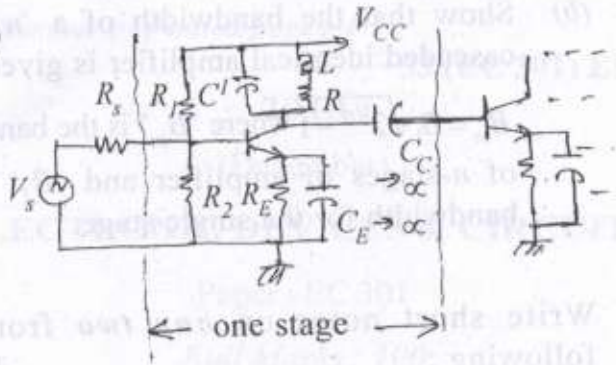
$C_{b'c} = 2pF$; $C_{b'e} = 200pF$; $\gamma_{bb'} = 20\Omega$;

$\gamma_{b'e} = 150\Omega$; $R_b = R_1 // R_2 = 2K\Omega$;

$R_L = 200\pi (R_c >> R_L)$. Find the mid-band gain and the higher $3dB$-cutoff frequency. 10



(b)



The above figure represents a capacitance coupled single-tuned amplifier. For this circuit, show that the voltage gain (without considering the source resistance R_s) is given by $A_V = \dfrac{\text{Ares}}{1 + j2\delta Qe}$

Where δ = fractional frequency deviation ;

Q_e = effective quality factor ;

Ares = Voltage gain at resonance. 10

5. *(a)* Show that for a double tuned inductively coupled amplifier ; the input impedance seen by the primary is 10

$$Z_{in} = \frac{W_0^2 M^2}{R_f} + j w_0 L_1 \text{ ; where}$$

the terms have their usual significance.

(b) Show that the bandwidth of a 'n' stage cascaded identical amplifier is given by

$B_{in} = B_1\sqrt{2^{1/n} - 1}$ where 'B_{in}' is the bandwidth of n-stages of amplifier and 'B_1' is the bandwidth for the single stage. 10

6. Write short notes on ***any two*** from the following : 10+10

(i) Hybrid-II model for BJT

(ii) Miller's theorem and Miller Capacitors.

(iii) Inductively coupled class-A power amplifier.
