Total No. of printed pages = 6

CAI-506/EC&D-II/5th Sem/2014/N

ELECTRONIC CIRCUITS AND DEVICES – II

Full Marks – 70

Pass Marks – 28

Time – Three hours

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

Answer any *five* questions.

1. (a) For the following potential divider biasing network, derive the relations for the following parameters using d.c analysis : 5

(i) I_B

(ii) I_C

(iii) V_{CE}

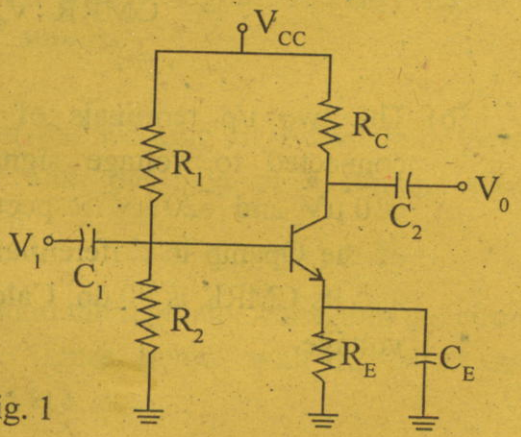

Fig. 1

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(b) Calculate I_C and V_{CE} of the network given in Fig. 1 using the following values.

R_1=34 KΩ, R_C=10 KΩ, R_2=3 KΩ, R_{E1}=1.5 KΩ, V_{CC}= +40V 2

(c) Using A.C analysis, deduce the relations for the following parameters in a potential divider biased CE configuration : 7

(i) Input Impedance

(ii) Output Impedance

(iii) Voltage Gain

2. (a) Show that in a differential amplifier using Opamp, the output voltage. 6

$$V_{out} = A_d V_d \left(1 + \frac{1}{CMRR} \frac{V_{cm}}{V_d} \right)$$

(b) The two i/p terminals of an Opamp are connected to voltage signals of strength 630 μV and 620 μV respectively. The gain of the Opamp in differential mode is 5×10^5 and its CMRR is 90 db. Calculate the output voltage. 3

(c) Deduce the relation for gain in a Opamp non-inverting amplifier configuration. Design a Opamp amplifier circuit with a voltage gain of +21. 5

3. (a) With the help of a circuit diagram and relevant mathematical relations, describe how Opamp can be used as an active high pass filter.

Design a high-pass filter at a cut-off frequency of 1 kHz with a passing gain of 2. 6

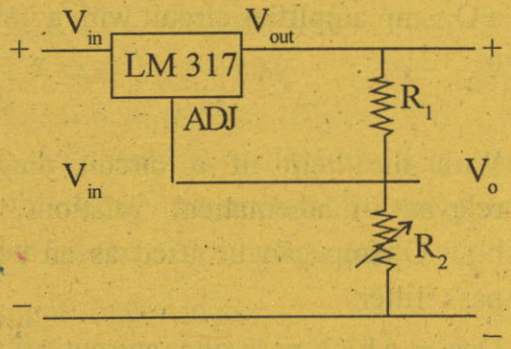
(b) Describe using block diagram and relevant circuit diagram, the operation of a shunt voltage regulator. 6

(c) Draw the circuit diagram of a 12V regulated power supply. 2

4. (a) Explain the working of a switching power supply with the help of a suitable block diagram. 5

(b) Determine the regulator voltage in the circuit of the figure below with R_1=240Ω and R_2 = 2.4 kΩ 2

Given V_{ref} = 1.25V and J_{adj} = 100μA.



(c) Draw the circuit diagram of a single tuned amplifier and explain its operation. Also discuss the frequency response characteristics. Deduce the relation for resonant frequency, Q-factor and bandwidth of the tuned amplifier circuit. 7

5. (a) Derive an expression for the input impedance in the following configurations : 4×2=8

(i) Voltage–series feedback

(ii) Voltage–shunt feedback.

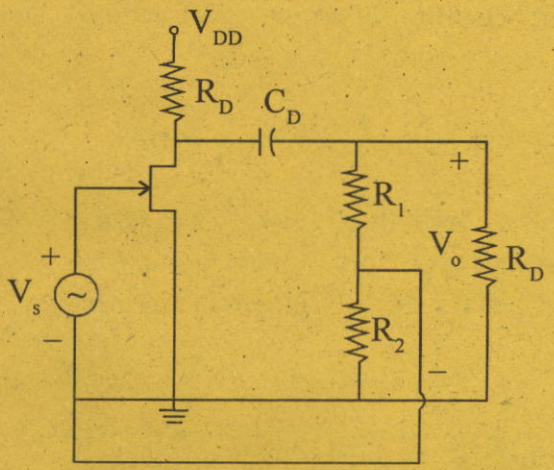
(b) Calculate the gain, input and output impedance of a voltage-series feedback amplifier having A= –300, R_i=1.5 kΩ, R_o=50 kΩ and β=–1. 4

(c) Draw the configuration for current-series feedback and current-shunt feedback in block diagrams. 2

6. (a) Calculate the gain without and with feedback for the FET amplifier circuit with the circuit values : 4

$R_1 = 80\ k\Omega$, $R_2 = 20\ k\Omega$, $R_0 = 10\ k\Omega$

$R_D = 10\ k\Omega$ and $g_m = 4000\ \mu S$



(b) Deduce the following in a Dual Input Balanced Output differential amplifier. 7

(i) Voltage Gain

(ii) CMRR

(c) Draw a circuit diagram of

(i) A series operated crystal oscillator

(ii) A shunt-excited crystal oscillator. 3

7. Write short notes on any *two* : 7×2=14

(a) Wein bridge oscillator

(b) Buck regulator

(c) IC 555 operation in astable and monostable multivibrator mode.