NEW SCHEME

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Third Semester B.E. Degree Examination, January/February 2005

EC/TE/EE/ML/BM/IT/CS/IS

Electronic Circuits

Time: 3 hrs. [Max.Marks : 100

Note: *1) Answer any FIVE full questions.*
2) All questions carry equal marks.
3) Missing data, if any may suitably be assumed giving valid reasons.

1. (a) Explain the validity of the piecewise linear approximation of the diode model. (5 Marks)

(b) For the clipping circuit shown in the following figure, obtain its transfer characteristic. Assume ideal diode. The input varies linearly from 0 to 150 volts. (7 Marks)

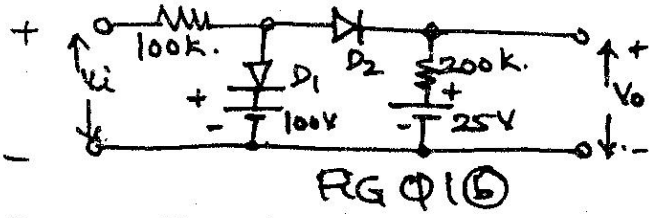

FIG Q1(b)

(c) Design a full wave rectifier with a capacitor filter to meet the following specifications
DC output voltage = 15 volts, Load resistance = $1k\Omega$
RMS ripple voltage on capacitor = $< 1\%$ of DC O/p voltage.
Assume the AC supply voltage as 230 Volts 50 Hz. (8 Marks)

2. (a) Distinguish clearly between bias compensation and bias stabilization. Explain how compensation is provided for UBE & ICO in transistor circuits. (10 Marks)

(b) Design a voltage divider bias circuit using a silicon transistor with $V_{cc} = +18V$, $I_c = 2.3mA$, $V_{CE} = 8.2volt$, $R_c = 3.3k\Omega$, $\beta = 100$ & $S(I_{co}) \leq 5$ (10 Marks)

3. (a) Derive expressions for AV, A_I, R_{in} & R_0 of an emittar follower. (10 Marks)

(b) For the circuit shown in the following figure, calculate $A_I = \frac{I_0}{I_i}$, A_V, A_{VS}, & R_i. The transistor parameters are $h_{ie} = 1.1k$, $h_{re} = 2.5 \times 10^{-4}$, $h_{fe} = 50$ & $h_{oe} = 25\mu A/$ volt.

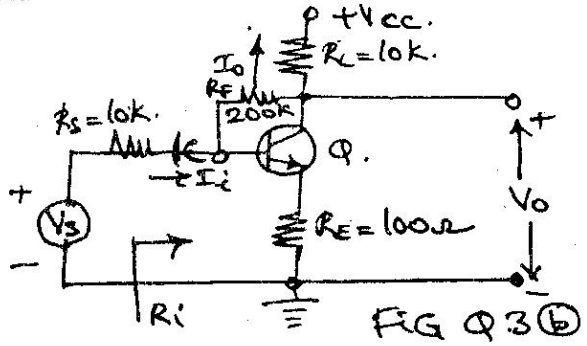

FIG Q3(b) (10 Marks)

4. (a) Draw the hybrid π model of a transistor and explain the significance of each component in the model. (6 Marks)

(b) What are the types of distorsion in amplifiers ? Explain. (7 Marks)

(c) With the usual notations, show that the low-3db frequency of an R_c coupled transistor amplifier is given by $f_L = \frac{1}{2\pi\left[R_o' + R_i'\right]C_b}$ (7 Marks)

Contd.... 2

5. (a) Derive an expression for the input resistance of
i) Current series feedback amplifier ii) Voltage shunt feedback amplifier (10 Marks)

(b) i) For the circuit shown, find the a.c. voltage v_i as a function of V_s and V_f. Assume that the inverting amplifier input resistance is infinite, that $A = A_v = -1000$; $\beta = \frac{V_f}{V_o} = \frac{1}{100}$, $R_s = R_c = R_E = 1K$, $h_{ie} = 1k\Omega$, $h_{re} = h_{oe} = 0$ & $h_{fe} = 100$

ii) Find $Av_f = \frac{V_0}{V_s} = A.\frac{V_i}{V_s}$

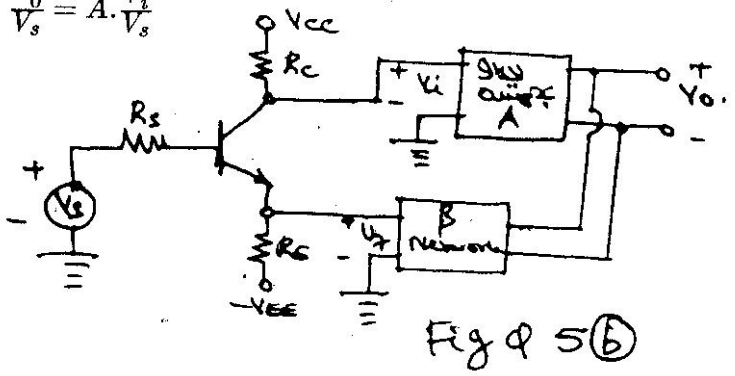

Fig Q 5(b)

(10 Marks)

6. (a) Derive an expression for the maximum conversion efficiency of a class B push pull amplifier. (10 Marks)

(b) A power transistor operating as class A in the circuit shown below is required to deliver a maximum of 5 watts to a 4Ω load. ($R_L = 4\Omega$). The quiescent point is adjusted for symetrical clipping and the collector supply voltage is $V_{cc} = 20volts$. Assume ideal characteristics with $V_{min} = 0$

i) What is the transformer turns ratio $n = \frac{N_2}{N_1}$

ii) What is the peak collector current I_m ?

iii) What is the quiescent operating point I_C, V_{CE} ?

iv) What is the collector circuit efficiency ? (10 Marks)

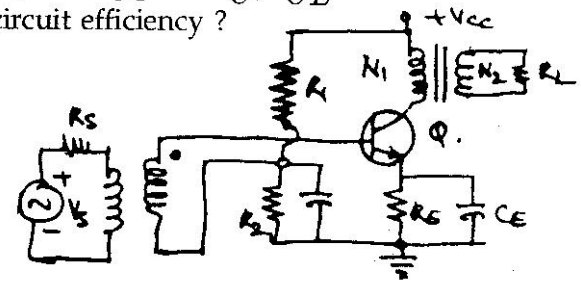

Fig Q 6(b)

7. (a) With the usual notations derive an expression for the voltage gain of a practical inverting op. amp. (7 Marks)

(b) Design a first order high pass filter (Butterworth type) to have a pass band gain of 4 and a cut off frequency of 2 kHz. Draw the circuit schematic of designed circuit. (6 Marks)

(c) Design an OP-amp schmitt trigger (inverting type) to next the following specification: $UTP = +2V$, $LTP = -4V$. & Output voltage swings between ±10 volts. If the input is $V_i = 5sin\omega t$, plot the waveforms of the input and output. (7 Marks)

8. (a) Explain the principle of operation of a $R-2R$ ladder type D to A converter. (10 Marks)

(b) Give the circuit schematic of a 555 timer connected as an astable multivibrator. Describe its operation. Derive an expression for its period. (10 Marks)

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