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B028412(028)

B. Tech. (Fourth Semester) Examination, Nov.-Dec. 2021

AICTE (~~New~~ Scheme)

(Electronics & Telecommunication Engineering Branch)

ANALOG CIRCUITS

Time Allowed : Three hours

Maximum Marks : 100

Minimum Pass Marks : 35

***Note** : All questions are compulsory. Part (a) of each question is compulsory and carries 4 marks. Attempt any **two** parts from (b), (c) and (d) from each question which carry 8 marks each.*

Unit-I

1. (a) State & prove Miller's theorem. 4

(b) Give analysis of a transistor amplifier using h-parameters and obtain the expression for following :

(i) Current gain

(ii) Voltage gain

(iii) Input resistance

(iv) Output resistance 8

(c) For amplifier shown below in fig. 1, calculate R_i, R_i' A_v, A_{vs} and $A_I' = -I_2/I_1$. The transistor parameters are $h_{ie} = 1100\,\Omega$, $h_{re} = 2{\cdot}5 \times 10^{-4}$, $h_{fe} = 50$, $h_{oe} = 24\ \mu$A/V. 8

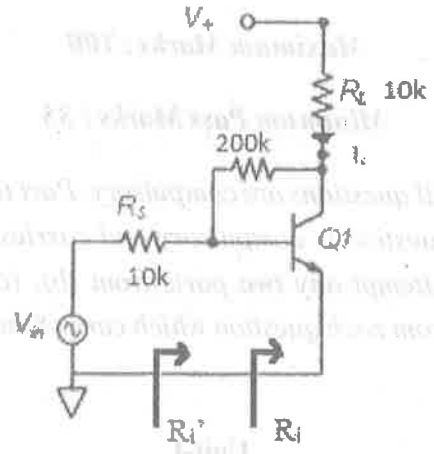

Fig. 1

(d) What is Darlington pair circuit? Drive expression for A_I and R_i for such a pair. 8

Unit-II

2. (a) Why h parameter model is not suitable for high frequency signals? Draw the small signal high frequency CE model of transistor. 4

(b) Derive the expression for following hybrid π -model parameters : 8

(i) $r_{b'e}$ in terms of h-parameters

(ii) $r_{bb'}$ in terms of h-parameters

(iii) $r_{b'c}$ in terms of h-parameters

(iv) Transconductance gain g_m

(c) The following transistor measurement are made at $I_C = 5$ mA, $V_{CE} = 10$ V and at room temperature

$h_{ie} = 600\,\Omega$, $h_{fe} = 100$

$|A_{ie}| = 10$ at 10 MHz $\quad C_C = 3$ PF

Find β cut-off frequency (F_β), gain bandwidth product (F_T), C_e, $r_{b'e}$ and $r_{bb'}$. 8

(d) Derive the expression of f_H for emitter follower at high frequency. 8

Unit-III

3. (a) Derfine Rise time in multistage amplifiers. How it is related with upper 3 dB frequency of the amplifiers? 4

(b) Compare the three types of coupling in multistage amplifiers. 8

(c) What is the effect on band pass when several identical amplifiers are cascaded in series? Drive the expression for overall upper and lower 3 dB frequency. Assume non-interacting stages. 8

(d) An amplifier consist of 3 identical stages in cascade, the bandwidth of overall amplifier extends from 20 Hz to 20 MHz. Calculate the bandwidth of individual stage. 8

Unit-IV

4. (a) What do you mean by negative feedback? List the characteristics of negative feedback amplifier. 4

(b) Derive the derivation of input resistance output resistance of voltage shunt feedback amplifier. 8

(c) Explain different feedback topologies in detail. 8

(d) The transistor shown in fig. 2 has the following parameter's : $h_{ie} = 1{\cdot}1\ \text{k}\Omega$, $h_{fe} = 50$ and $h_{re} = h_{oe} = 0$. Calculate A_{vf}, R_{if} and R'_{of}. 8

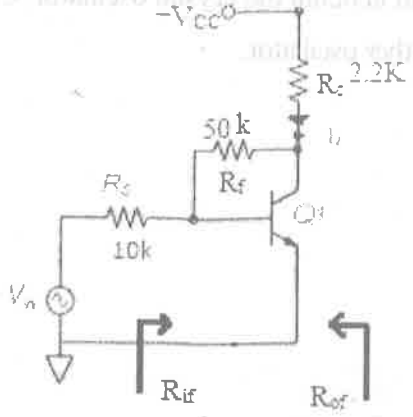

Fig. 2

Unit-V

5. (a) What is the Barkhausen Criterion for the feedback oscillator? 4

(b) What is $R - C$ phase shift oscillator? Derive the expression $f = \frac{1}{2\pi RC}\frac{1}{\sqrt{6}+4k}$; $k = \frac{R_c}{R}$. 8

(c) Draw the circuit of Wien Bridge oscillator and explain its working principle. Drive the expression for frequency of oscillations. 8

(d) Explain in detail the crystal oscillator. Compare it with other oscillator. 8