

Printed Pages – 6

Roll No. : .....

**328413(28)**

**B. E. (Fourth Semester) Examination, 2021**

**(Old Scheme)**

**(AEI, EEE, EI, ET & T & Mechatronics Engg. Branch)**

**ANALOG ELECTRONIC CIRCUITS**

***Time Allowed : Three hours***

***Maximum Marks : 80***

***Minimum Pass Marks : 28***

***Note : Part (a) of each question is compulsory and attempt any two part from (b) and (c) of each questions.***

**Unit-I**

1. (a) Which configuration among CB, CE and CC is used as a constant source? 2

[ 2 ]

- (b) With the help of circuit diagram state and prove Miller theorem. 7
- (c) Derive the expressions for input resistance ( $Z_i$ ) output resistance ( $Z_o$ ) and voltage gain ( $A_v$ ) for a JFET amplifier with potential Divider bias and self-bias ( $R_s$  by passed). 7
- (d) Show that the ratio of voltage gains and current gain of a BJT Amplifier with load and source resistance taken into account is independent of h-parameters of the transistor provided the equivalent current and voltage sources have the same resistance. 7

### Unit-II

2. (a) How do hybrid- $\pi$  parameters vary with temperature? 2
- (b) Draw the circuit and derive the expression for CE short circuit current gain  $A_i$  in terms at any frequency  $f$  and  $f_\beta$  of the BJT. 7

[ 3 ]

- (c) Prove that gain bandwidth product : 7

$$|A_{vs} \text{ of } H| = \frac{f_T R_L}{1 + 2\pi f_T C_c R_L R_s + r_{bb'}}$$

- (d) The following measurements at room temperature are made at  $g_m = 50\text{mA/V}$ ,  $r_{b'e} = 1 \text{ K}$ ,  $C_e = 3 \text{ pF}$  and  $C_c = 0.2 \text{ pF}$ . Compute  $f_\beta$  and  $f_i$ . 7

### Unit-III

3. (a) Justify, multistage amplifier reduces Bandwidth. 2
- (b) Define noise. What are the various sources of noise? Explain in brief? 7
- (c) Justify with derivation "the bandwidth of cascaded amplifier is always less than of the badwidth of single stage amplifier." 7
- (d) When  $n$  identical (non-interacting) stages of amplifiers are cascaded, derive the expressions for overall gain, lower cut-off frequency and higher cut-off frequency. 7

[ 4 ]

**Unit-IV**

4. (a) What type of feedback is used in amplifiers? Mention its advantages. 2

(b) An amplifier consists of three identical stages connected in cascade. The output voltage is sampled and returned to the input in series opposing. If it is specified that the relative change  $\frac{dA_f}{A_f}$  in the closed

loop voltage gain  $A_f$  must not exceed  $\psi f$ , show that the maximum value of the open loop gain  $A$  of the amplifier is given by 7

$$A = 3A_f \left| \frac{\psi_1}{\psi_2} \right| \text{ where } \psi_1 = \frac{dA_i}{A_i}$$

(c) Draw an equivalent circuit of feedback amplifier which given high  $R_i$  and high  $R_o$ . Also derive the relation for  $R_i$ ,  $R_o$  and  $R'_{of}$  in terms of forward and backward gain for the same topology. 7

[ 5 ]

(d) For the circuit shown take  $R_C = 4 \text{ K}$ ,  $R' = 40 \text{ K}$ ,

$R_s = 10 \text{ K}$ ,  $h_{ie} = 1.1 \text{ K}$ ,  $h_{fe} = 50$  and  $h_{re} = h_{oe}$

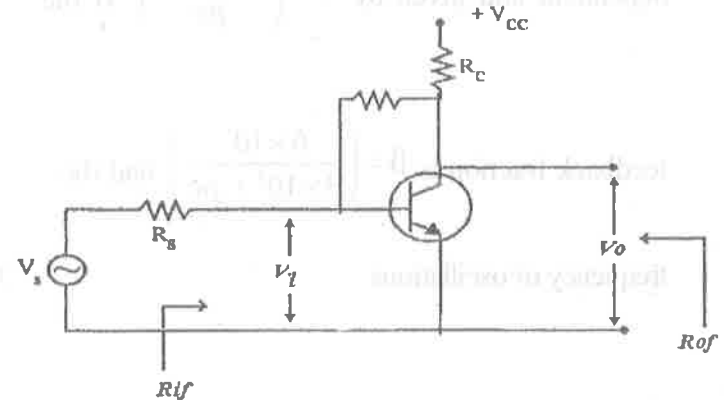
$= 0$ . 7

Find :

(i)  $A_{vf}$

(ii)  $R_{if}$  and

(iii)  $R'_{of}$



**Unit-V**

5. (a) Draw the equivalent circuit of quartz crystal. 2

[ 6 ]

(b) Draw the circuit and explain the working of Hartely oscillator using BJT. Write expression for frequency of oscillation. 7

(c) What do you mean by frequency stability of an oscillator? State the frequency stability criterion for an oscillator. How you can compare the frequency stability of two oscillators? 7

(d) The gain of a forward amplifier is frequency

dependent and given by  $A = \left( \frac{-9 \times 10^6}{j\omega} \right)$ . If the

feedback fraction is  $\beta = \left( \frac{6 \times 10^3}{3 \times 10^3 + j\omega} \right)$  find the

frequency of oscillations. 7

