



**324513 (24)**

BE (5<sup>th</sup> Semester)

Examination, Nov.-Dec., 2013

Branch : Electrical

**ANALOG ELECTRONICS**

Time Allowed : Three Hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : (i) Part (a) of each unit is compulsory.

(ii) Attempt any two parts from (b), (c) & (d).

**Unit-I**

Q. 1. (a) Define base spreading resistance? Also

write its expression?

2

**324513 (24)**

15

P.T.O.

17



(2)

b) For a given emitter follower circuit at high

frequency obtain  $K = \frac{V_o}{V_i}$  and with  $g = g_m$

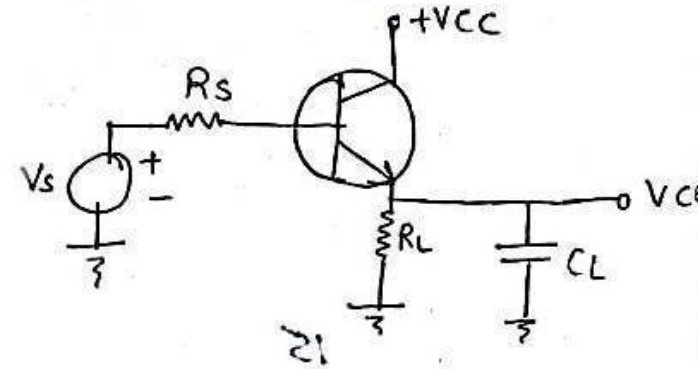
g/b'e.

Verify that :

$$i) K = \frac{g R_L}{1 + g R_L} \frac{1 + j\omega C_e / g}{1 + j\omega R_L \left( \frac{C_L + C_e}{1 + g R_L} \right)}$$

ii) If  $g R_L \gg 1$  &  $\omega C_L \gg \omega C_e$ , show that

$$K \approx \frac{1}{1 + jf/f_H} \quad \text{and} \quad f_H = \frac{g}{2\pi C_L}$$

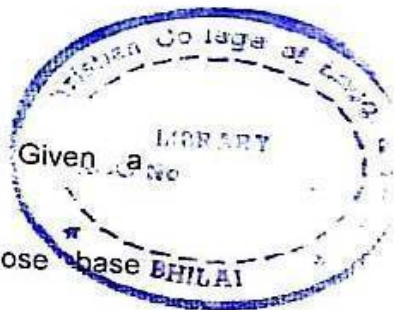


**324513 (24)**

3245

(3)

(c) Define diffusion capacitance ?



Given

Germanium PNP transistor whose base width is  $10^{-4}$  cm at room temperature and for

dc emitter current of 2 mA find : 7

(i) Emitter diffusion capacitance ?

(ii) Figure of merit if diffusion of holes is  $47 \text{ cm}^2/\text{sec}$  ?

(d) Derive an expression for current gain including load resistance at high frequency for a CE amplifier ? Also, explain it's 3 dB cut off frequency ? 7

24513 (24)

16

P.T.O.

(4)

Unit-II



Q. 2. (a) Define harmonic distortion in amplifier

Write an expression for THD ?

(b) Explain a class A power amplifier with maximum efficiency and also prove efficiency ?

(c) A power amplifier supplies 3 W to a load  $6 \text{ k}\Omega$ . The zero signal dc collector current is 55 mA and the collector current with signal is 60 mA. How much is the percentage second harmonic distortion ?

324513 (24)

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(5)

(d) What do you mean by cross-over distortion in class-B push-pull amplifier and how it can be prevented ? 7

**Unit-III**

Q. 3. (a) Define dominant pole ? 2

(b) Derive high frequency response of an amplifier, also find it's response for step input and prove that  $\phi \approx \frac{-90^\circ}{fH}$  7

(c) The transfer function  $\frac{V_o}{V_s}$  of an amplifier has n poles  $s_1, s_2, \dots, s_n$  and K zeros  $sz_1, sz_2, \dots, sz_k$  is as follows : 7

$$T.P = \frac{V_o}{V_s} = \frac{K(s-sz_1)(s-sz_2)\dots(s-sz_k)}{(s-s_1)(s-s_2)\dots(s-s_n)}$$

If zero are of much higher frequency than poles, then prove that :

17

324513 (24)

P.T.O.

(6)

(i) An approximate expression for high 3db frequency  $f_H^*$  is given by :

$$= \sqrt{\frac{1}{f_1^2} + \frac{1}{f_2^2} + \frac{1}{f_3^2} \dots \frac{1}{f_n^2}}$$

(ii) An expression which gives more accurate result is :

$$\frac{1}{f_H^*} = \sqrt{\frac{1}{f_1^2} + \frac{1}{f_2^2} + \dots + \frac{1}{f_n^2}}$$

(d) Verify that voltage gain of Darlington pair amplifier is given by : 7

$$A_v = 1 - \frac{h_{fe2}}{R_{i2}} (2 + h_{oe} h_{fe} R_L)$$

**Unit-IV**

Q. 4. (a) Draw pin diagram of IC741. 2

324513 (24)

17



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(b) Define Op-amp. Give its various application

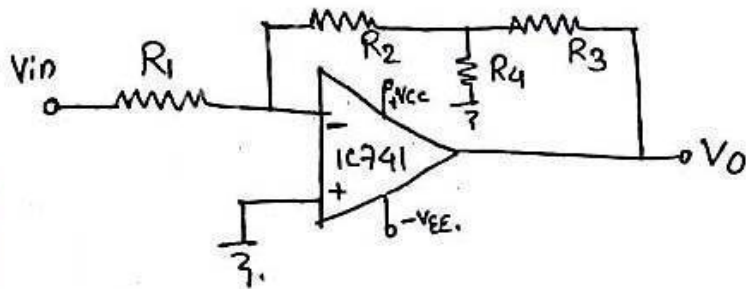
and explain integrator using Op-amp.

Also, find its output for sine and square

wave ? 7

(c) For circuit shown below prove that : 7

$$\frac{V_o}{V_{in}} = - \left[ \frac{R_3}{R_1} + \frac{R_2}{R_1} + \frac{R_2 R_3}{R_1 R_4} \right]$$



(d) Find  $V_o$  in terms of  $V_1$  and  $V_2$  for Op-amp

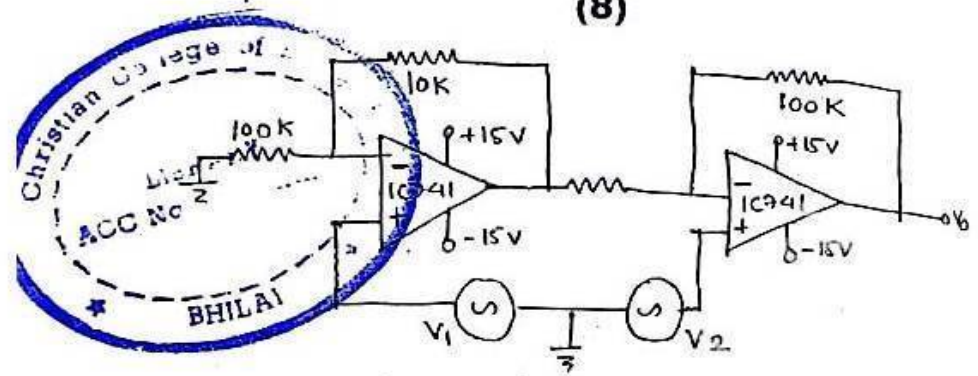
circuit shown. Consider ideal Op-amps ? 7

18

324513 (24)

P.T.O.

(8)



Unit-V

Q. 5. (a) Define etching ? 2

(b) Explain steps of IC fabrication ? 7

(c) Explain manufacturing of integrated resistors ?

Also, define sheet resistance ? 7

(d) Explain Ion Implantation technique used in IC

fabrication ? 7

324513 (24)

8