

THIRD SEMESTER EXAMINATION – 2005

ANALOGUE ELECTRONICS CIRCUITS

Full Marks : 70

Time : 3 Hours

Question No. 1 which is compulsory and any five from the remaining questions.

The figures in the right-hand margin indicate marks for the questions.

1. Answer the following questions : 2×10

- (a) Why it is necessary to provide proper d.c. biasing to a transistor / FET ?
- (b)  $h_{21}$  and  $h_{12}$  are small signal low frequency equivalent hybrid parameters of a transistor. Interpret them.

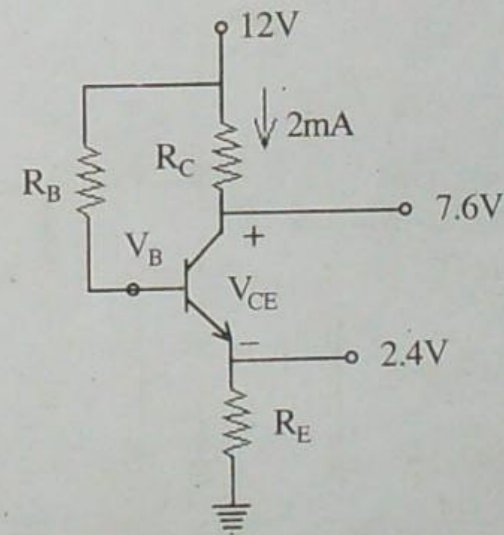
P.T.O.

- (c) Write Shockley's equation. How it is used to design d.c. biasing of JFET ?
- (d) The voltage gain of an amplifier with negative feedback is 100. If the feedback factor is 0.3, find the voltage gain without feedback.
- (e) An amplifier bursts into oscillation when the loop gain  $A\beta = 1$ , but for sustained oscillation  $A\beta > 1$ . Why so ?
- (f) Four identical amplifiers are connected in cascade. Each has an upper cut off frequency of 40 KHz. find the overall bandwidth of the cascade.
- (g) List the characteristics of an ideal OP-AMP. What is CMRR ?
- (h) What is an active filter ? Draw the circuit diagram of a lowpass active filter using an OP-AMP. Draw its frequency response.

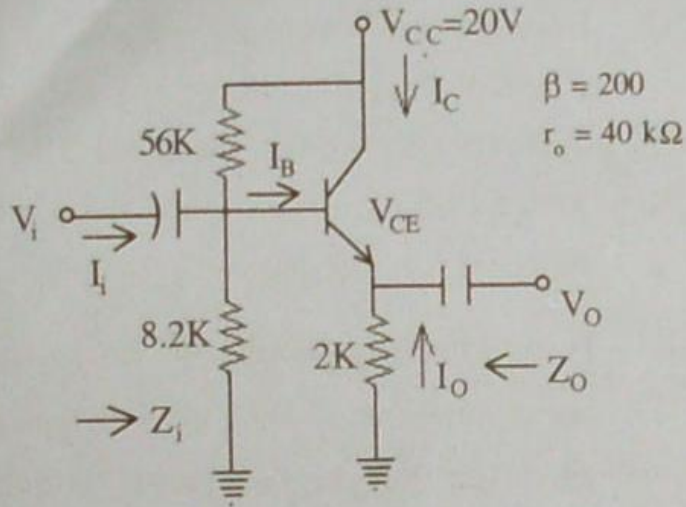
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- (i) Draw the gain frequency response of an RC coupled amplifier. Make the cut off frequencies. Show that the gain falls off at  $-6 \text{ dB / octave}$  from cut off frequencies on either side of midband.
- (j) Power amplifiers – are they small signal or large signal amplifiers ? Why class B type power amplifier has higher power conversion efficiency than class A type ?

2. In the given circuit determine  $R_C$ ,  $R_E$ ,  $R_B$ ,  $V_{CE}$  and  $V_B$ . The transistor has a  $\beta = 80$ . 10



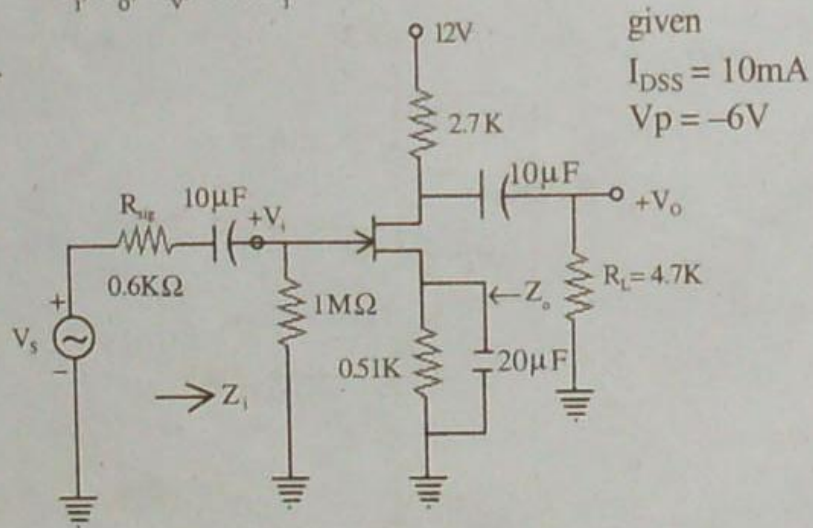
3.



For the above circuit calculate  $I_B$  and  $I_C$ . Determine  $r_e$ . Draw the remodeled equivalent circuit. Determine  $Z_i$ ,  $Z_o$ ,  $A_v$ , and  $A_i$ .

10

4.



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For the given circuit

(a) Develop the no-load two-port model in terms of  $A_{VNL}$ ,  $Z_i$  and  $Z_o$ . 5

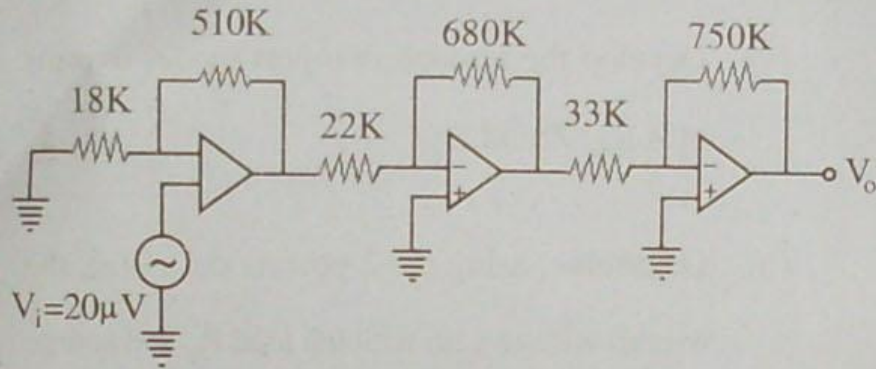
(b) Determine, using the 2-port model of (a), the overall voltage gain with the load  $R_L$  and source resistance  $R_{sig}$  connected. 5

5. (a) What are the advantages of providing negative feedback to an amplifier? 3

(b) Draw an emitter follower or source follower circuit. (i) What is the type of feedback? (ii) Find the feedback factor. Find the voltage gain with and without feedback. (iii) How are the input and output impedances affected by feedback? 7

6. (a)

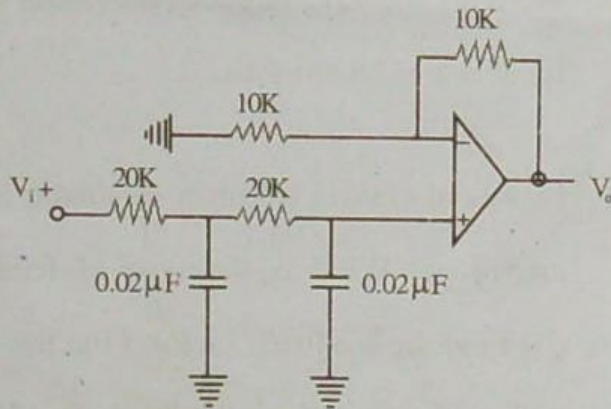
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Calculate the output voltage  $V_o$  of the above circuit.

(b)

5



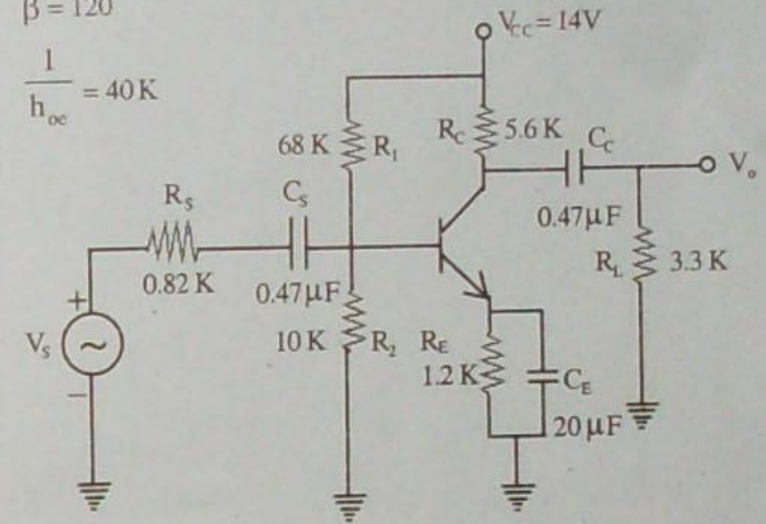
- (i) What is the filter type ?
- (ii) Calculate the cut of frequency of the filter.

7.

Given

$$\beta = 120$$

$$\frac{1}{h_{oe}} = 40K$$



Obtain the cut off frequencies associated with  $C_s$ ,  $C_C$  and  $C_E$ .

10

8. Draw the circuit diagram of a class A transformer coupled power amplifier using an npn transistor. This amplifier drives a  $16\Omega$  speaker through a 4 : 1 transformer, using a power supply of  $V_{CC} = 36V$ , the circuit delivers 2 watts to the load. Calculate :

- (a) ac power across transformer primary,
- (b) ac voltage across the load, and
- (c) the rms value of load current.

10