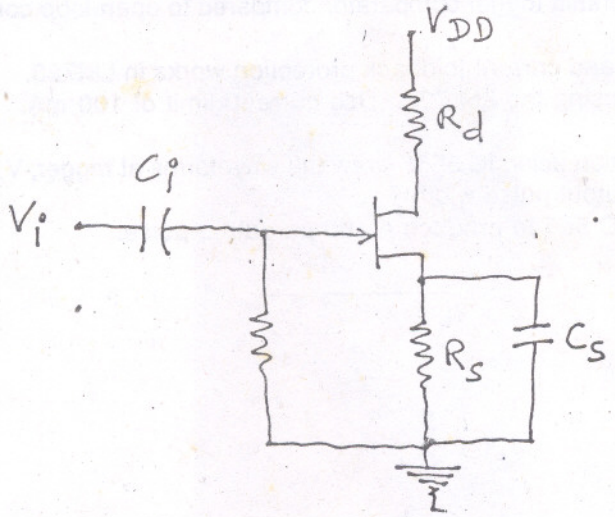
Sem III CMPN & I.T. Electronics Devices & Circuits 16/5/06

Con. 1714-06. (REVISED COURSE) TV-7965

(3 Hours) [Total Marks : 100

N.B. (1) Question No. **1** is **compulsory.**
(2) Answer any **four** out of remaining **six** questions.
(3) Assume **suitable** data wherever **required.**

1. (a) The amplifier of **figure** utilizes an n-channel FET for which $V_p = -2{\cdot}0$ V, $g_{mo} = 1{\cdot}60$ mA/V and $I_{DSS} = 1{\cdot}65$ mA. It is desired to bias the circuit at $I_D = 0{\cdot}8$ mA using $V_{DD} = 24$ V. Assume $r_d >> R_d$. **12**
Find — (i) V_{GS}, (ii) g_m, (iii) R_S, (iv) R_d, such that voltage gain is atleast 20 dB, with R_S by passed with a very large capacitance.



(b) What method is used to bias an FET against device and temperatue variation ? Explain how this is effective. **8**

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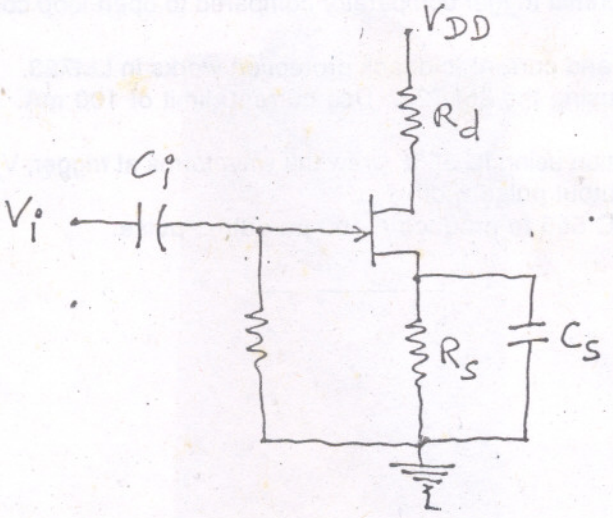

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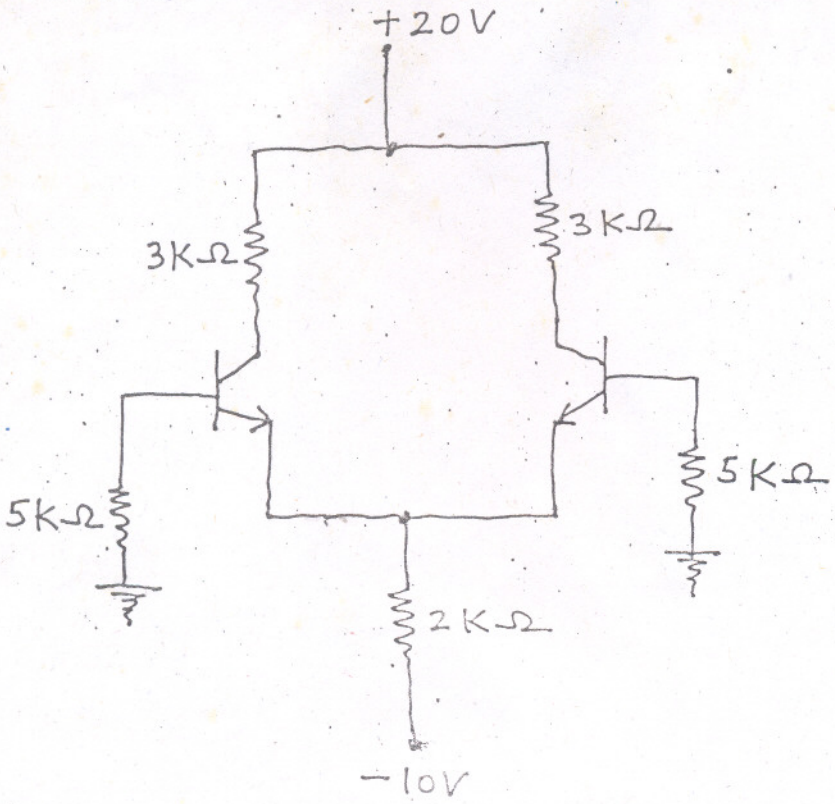
2. (a) Draw and explain current-mirror circuit. 8

(b) For the circuit shown in **figure**, determine the following :— 12

(i) I_E, I_{E_1}, I_{E_2}

(ii) Collector to ground voltage

(iii) base-voltage.



Given —

$V_{BE} = 0{\cdot}7$ V

$\beta = 100$

both the transistors are matching.

3. (a) Explain the difference between the integrator and differentiator and give one application of each. 8
   (b) What are the advantages of using an instrumentation amplifier versus simple OP-AMP differential amplifier ? 12
   Explain how to construct basic instrumentation amplifier from general purpose OP-AMP.
   Derive an expression for V_{out}.

4. (a) Draw circuit diagram of second order Butterworth active filter using OP-AMP. Give its frequency response curve. Give practical application of this filter. 15
   (b) Compare active and passive filters. 5

5. (a) Draw and explain phase-shift oscillator using OP-AMP. Derive expression for frequency of oscillation and gain factor β of ladder network. 12
   (b) Give the advantages of Schmitt trigger comparator compared to open-loop comparator using OP-AMP. 8

6. (a) Explain how current-limit and current foldback protection works in LM723. 8
   (b) Design a +9 V regulator using the LM 723. Use current limit of 100 mA. 12

7. (a) Explain monostable operation using IC 555. Draw the waveforms at trigger, V_{out}, and across capacitor. Derive the equation for output pulse width T_{out}. 15
   (b) Design the circuit using IC 555 to produce a 100 μs output pulse. 5
