

Seat No.	
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[4757]-1043

**S.E. (E&TC/Electronics) (I Sem.) EXAMINATION, 2015**  
**ELECTRONIC DEVICES AND CIRCUITS**  
**(2012 PATTERN)**

**Time : Two Hours****Maximum Marks : 50**

- N.B. :-** (i) Attempt Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.
- (ii) Neat diagrams must be drawn wherever necessary.
- (iii) Figures to the right indicate full marks.
- (iv) Use of calculator is allowed.
- (v) Assume suitable data if necessary.

1. (a) List the sources of instability of collector current. Explain self-bias circuit in detail. [6]
- (b) The transistor in the given circuit is connected as a common emitter amplifier. Calculate  $A_v$ ,  $R_i$ ,  $R_o$ . Refer Fig. 1. Assume  $h_{ie} = 1.1 \text{ k}\Omega$ ,  $h_{fe} = 50$ ,  $h_{re} = 2.5 \times 10^{-4}$ ,  $h_{oe} = 1/40 \text{ k}$ . [6]

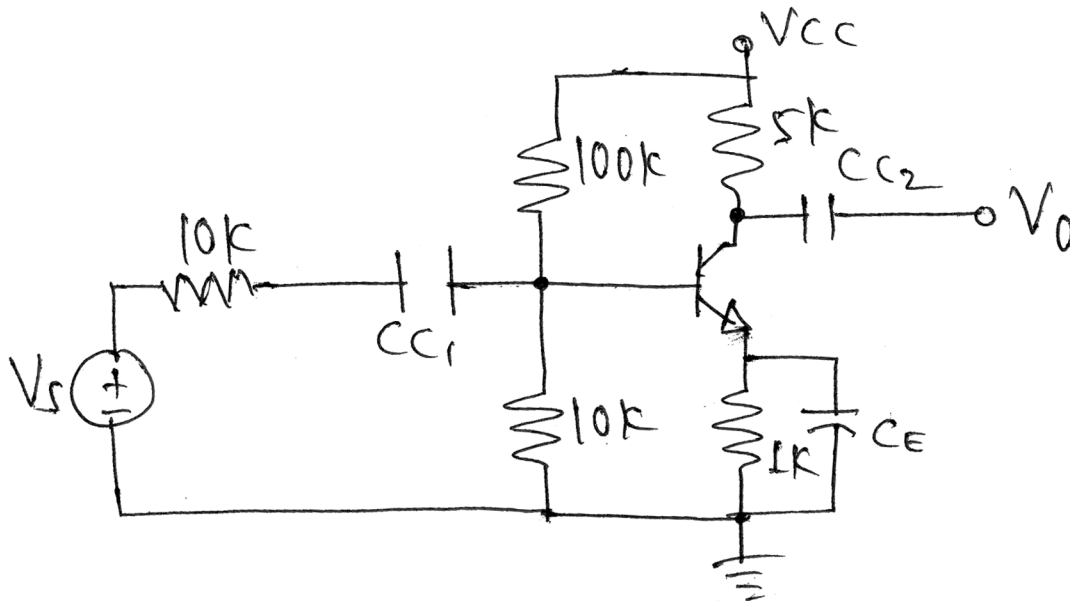


Fig. 1

P.T.O.

*Or*

2. (a) Write a short note on thermal runaway. Explain thermal stability. [6]  
(b) Describe the method to increase the input resistance using Darlington connection. [6]
3. (a) Draw and explain hybrid- $\pi$  common emitter transistor model. [6]  
(b) In Colpitts oscillators  $L_2 = 5 \mu\text{H}$ ,  $C_1 = C_2 = 0.001 \mu\text{F}$ . What will be the frequency of oscillations. If value of inductor is doubled what will be frequency of oscillations ? What should be the value of inductor to get frequency double to that of original frequency ? [6]

*Or*

4. (a) For three stage RC coupled amplifier overall upper 3 dB frequency is 16 kHz and overall lower 3 dB frequency is 25 Hz. What are the values of  $F_L$  and  $F_H$  for each stage ? Assume all stages identical. Also calculate bandwidth of each stage. [6]  
(b) Draw and explain various topologies of negative feedback. [6]
5. (a) What is cross over distortion ? Describe a method to minimize this distortion. [6]  
(b) A class-A amplifier operates from  $V_{CC} = 20 \text{ V}$ , draws a no signal current of 5 Amp and feeds a load of  $40 \Omega$ , through a step up transformer of  $\frac{N_2}{N_1} = 3.16$ . Find :  
(i) Whether the amplifier is properly matched for maximum power transfer ?  
(ii) Maximum a.c. signal power output.  
(iii) Maximum d.c. power input.  
(iv) Conversion efficiency at maximum signal input. [7]

Or

6. (a) Draw and explain complementary symmetry class-B power amplifier. [6]
- (b) A power amplifier supplies 3 watt to a load of  $6\text{ k}\Omega$ . The zero signal d.c. collector current is 55 mA and the collector current with signal is 60 mA. How much is the percentage second harmonic distortion ? [7]
7. (a) Explain the following non-ideal current voltage characteristics of MOSFET :
- (i) Body effect
  - (ii) Temperature effects
  - (iii) Breakdown effects. [6]
- (b) Calculate the drain current and drain to source voltage of a common source circuit with an N-channel EMOSFET shown in Fig. 2. Find the power dissipated in the transistor. Given  $V_{TN} = 1\text{ V}$  and  $K_n = 0.1\text{ mA/V}^2$ . [7]

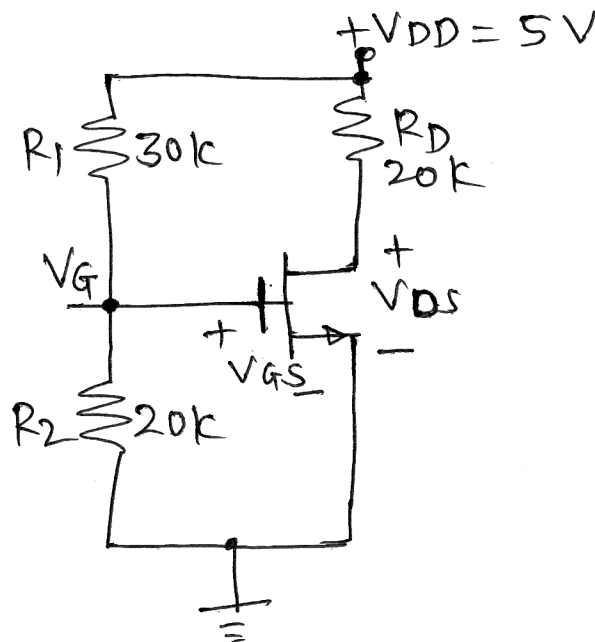


Fig. 2

Or

8. (a) Determine the small signal voltage gain for a CS amplifier shown in Fig. 3. Transistor parameters are  $V_{TN} = 2\text{ V}$ ,  $K_n = 0.5\text{ mA/V}^2$  and  $\lambda = 0$ . Assume the transistor is biased such that  $I_{DQ} = 0.4\text{ mA}$ . [7]

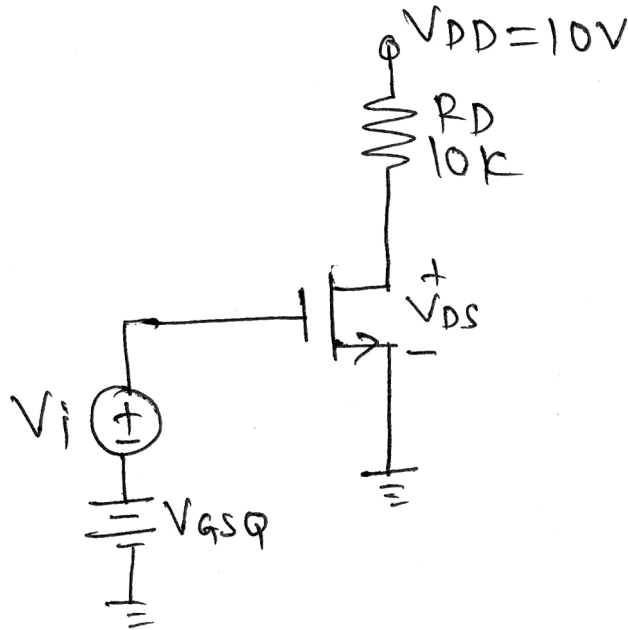


Fig. 3

- (b) Write a short note on Bi-CMOS technology. [6]