

Total No. of Questions—8]

[Total No. of Printed Pages—4+1

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[4957]-1042

S.E. (E & TC/Electronics) (First Semester) EXAMINATION, 2016

ELECTRONIC DEVICES AND CIRCUITS

(2012 PATTERN)

Time : Two Hours

Maximum Marks : 50

N.B. :— (i) Attempt Q. Nos. 1 or 2, Q. Nos. 3 or 4, Q. Nos. 5 or 6, Q. Nos. 7 or 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) Compare C_E , C_B and C_C amplifier on the basis of the following : [6]

(i) A_v

(ii) A_i

(iii) R_i

(iv) R_o

(v) h -parameter model

(vi) Application.

P.T.O.

- (b) For the ckt. shown in Fig. 1, Si transistor with $\beta = 100$ is used. Calculate I_B , I_C and V_{CE} . [6]

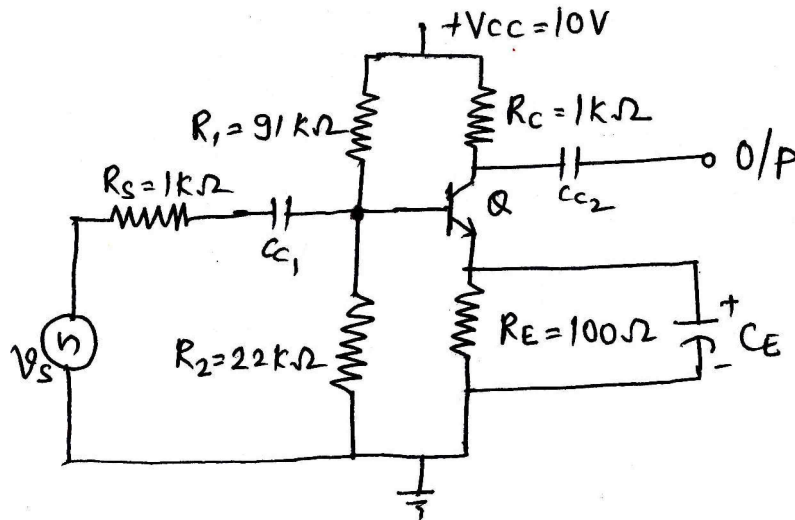


Fig. 1

Or

2. (a) For the ckt. shown in Fig. 1, Si transistor with $h_{ie} = 1.1\text{k}\Omega$, $h_{fe} = 50$, $h_{re} = 2.5 \times 10^{-4}$, $h_{oe} = 25 \mu\text{A/V}$ is used. Calculate A_i , A_v , R_i , R_i' , R_o and R_o' . [6]
- (b) Derive the expression for stability factor S' for the voltage divider bias circuit. [6]
3. (a) For the amplifier shown in Fig. 2, determine the overall low frequency response. The transistor used has $h_{ie} = 1\text{k}\Omega$, $h_{fe} = 100$, $h_{re} = h_{oe} = 0$. [6]

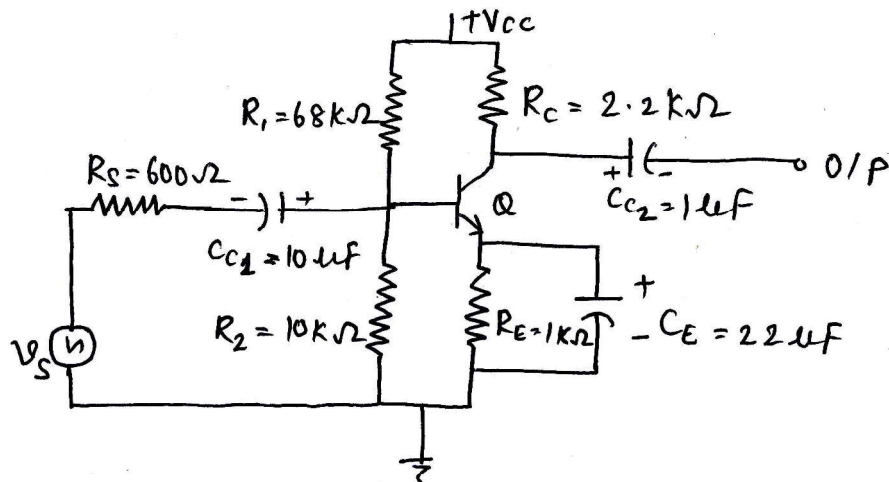


Fig. 2

- (b) Draw and explain Colpitts' oscillator using BJT. Calculate the frequency of oscillation when $C_1 = 0.001 \mu\text{F}$, $C_2 = 0.001 \mu\text{F}$ and $L = 5 \mu\text{H}$. [6]

Or

4. (a) Explain the effect of internal capacitances of transistor used in amplifier ckt. on bandwidth of amplifier with frequency response curve. Define F_α and F_β separately. [6]
- (b) Determine the bandwidth of a feedback amplifier with an open loop gain $A = 10^4$, an open loop bandwidth $\text{BW}(\omega) = 2\pi \times 100 \text{ rad/s}$. and a closed loop gain $A_f = 50$. Comment on the effect of decrease in gain on bandwidth. [6]
5. (a) Draw transformer coupled class A power amplifier and show that maximum efficiency is 50%. [6]
- (b) A class B complementary-symmetry power amplifier operates with $V_{\text{CC}} = 12\text{V}$, $R_L = 4\Omega$. If the input is sinusoidal, calculate : [7]
- (i) Maximum power output
 - (ii) Efficiency for maximum output
 - (iii) Power dissipation in both transistors
 - (iv) Power dissipation in each transistor.

Or

6. (a) Explain with ckt. diagram, how even harmonics are eliminated in class B push pull power amplifier. [6]

- (b) The following measurements were taken on output of a class A power amplifier to estimate second harmonic distortion.

$$I_{CQ} = 1.5 \text{ A}, I_{\max} = 2.9 \text{ A}, I_{\min} = 0.2 \text{ A}.$$

Calculate : [7]

- (i) Shift of Q-point in terms of collector current
(ii) Percentage second harmonic distortion.

7. (a) Give comparison between MOSFET and BJT. [6]

- (b) For the circuit shown in Fig. 3, the MOSFET parameters are $V_T = 1.5 \text{ V}$, $k = 0.8 \text{ mA/V}^2$.

Determine V_{GS} , V_{DS} and I_D , and show that MOSFET is biased in the saturation region. [7]

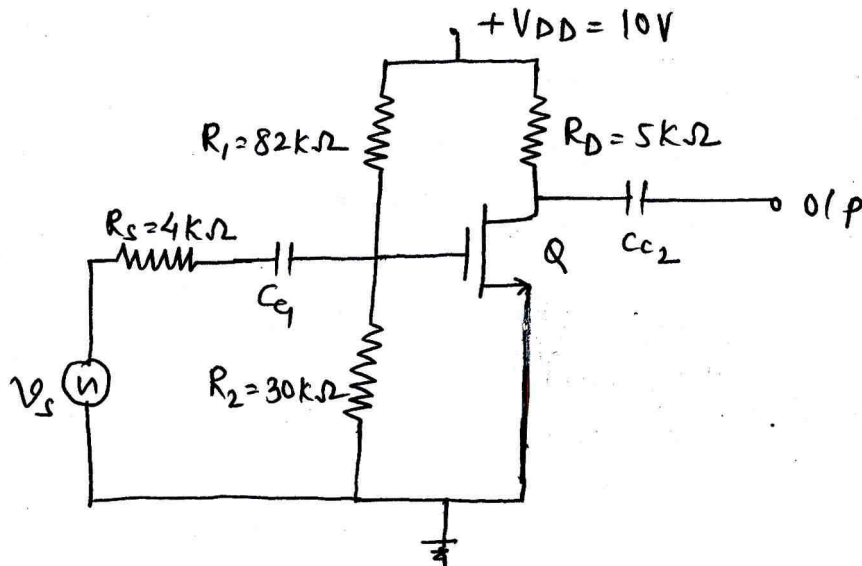


Fig. 3

Or

8. (a) For the ckt. shown in figure 3, determine :

g_m , A_v , R_i , R_i' , R_o and R_o' .

Given, $V_T = 1.5V$, $k = 0.8 \text{ mA/V}^2$ and $r_o = 40k\Omega$. [7]

(b) Explain various non-ideal current-voltage characteristics of EMOSFET. [6]