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[5057]-62

S.E. (Electronics/E & TC) (First Semester)

EXAMINATION, 2016

SOLID STATES DEVICES AND CIRCUITS

(2008 PATTERN)

Time : Three Hours

Maximum Marks : 100

- N.B. :—**
- (i) Answers to the two sections should be written in separate answer-books.
 - (ii) Neat diagrams must be drawn wherever necessary.
 - (iii) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

SECTION I

1. (a) Explain construction, operation and characteristics and application of photodiode. [8]
- (b) Explain construction, operation and characteristics of p -channel E-MOSFET. [8]

Or

2. (a) State the types of switching diodes and also list the applications of switching diodes. [8]
- (b) Explain different scaling models of MOSFET, also explain various scaling factors and limitations of scaling. Explain small geometry effects. [8]

P.T.O.

3. (a) For the CS amplifier circuit shown in Fig. 1. Calculate the voltage gain A_v .
Assume $k = 1 \text{ mA/V}^2$, $\lambda = 0$, $V_T = 0.8 \text{ V}$. [8]

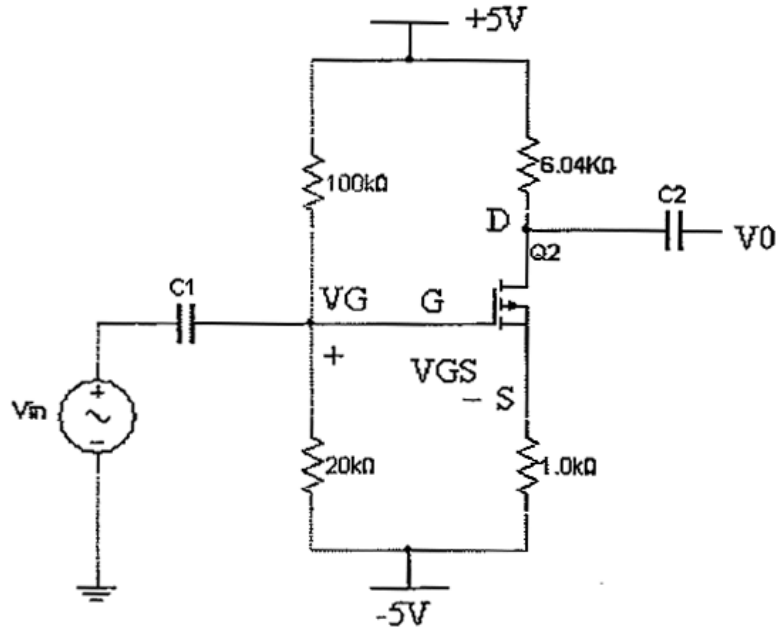


Fig. 1

- (b) Determine I_{DQ} , V_{GSQ} and V_{DS} for the circuit shown in Fig. 2
Given $V_{GS(TH)} = 5 \text{ V}$, $I_{D(on)} = 3 \text{ mA}$ at $V_{GS(on)} = 10 \text{ V}$. [8]

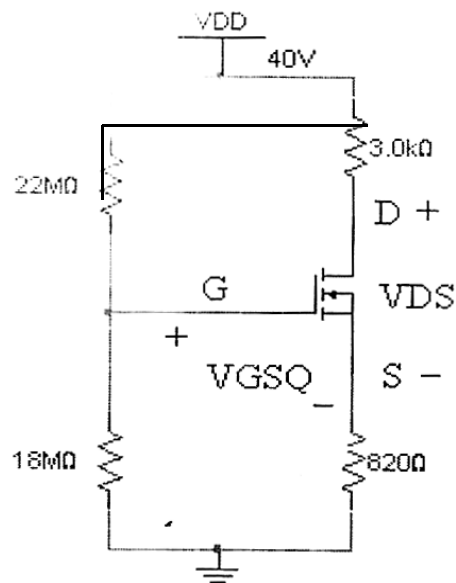


Fig. 2

Or

4. (a) Write a short note on 'Bi-CMOS' invertor. [8]
(b) For the CS amplifier circuit shown in Fig. 3. Calculate the voltage gain A_v .
Assume $k = 0.82 \text{ mA/V}^2$, $\lambda = 0.022/\text{V}$, $V_T = 1 \text{ V}$. [8]

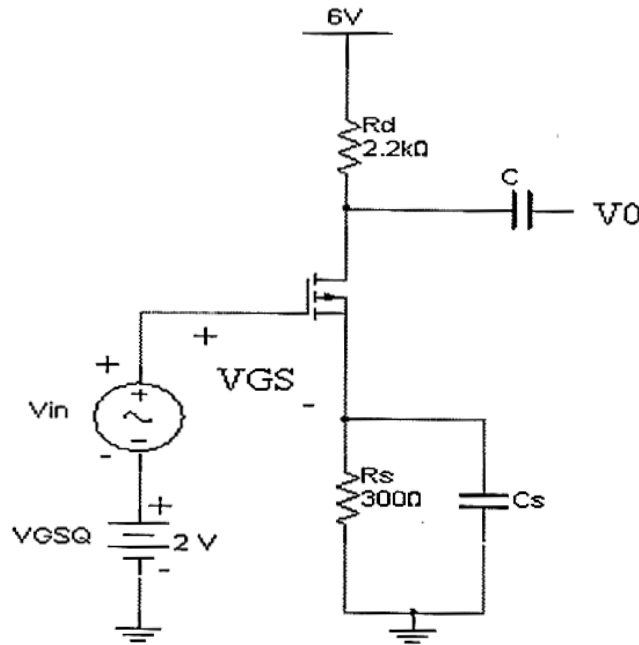


Fig. 3

5. (a) Compare CE, CB, CC configurations of transistor. [6]
(b) Explain : [8]
(i) Thermal stabilization
(ii) Thermal runaway.
(c) What is the need of cascading amplifier ? Give the selection of configuration in multistage amplifier. [4]

Or

6. (a) Define the three thermal stability factors. [6]
(b) Why the biasing is necessary in BJT amplifiers ? Explain any *one* bias compensation technique. [8]
(c) Explain different types of hybrid parameters. [4]

SECTION II

7. (a) Derive the expression for sag and tilt for the square wave testing method. [8]
(b) Explain the effect of various capacitors listed below on frequency response of an Amplifier :
(i) Coupling capacitor
(ii) Emitter or source bypasses capacitor
(iii) Junction capacitance.
List the advantages of square wave testing. [10]

Or

8. (a) Draw and explain the small signal high frequency CE π -model of a transistor. [8]
(b) An RC coupled amplifier mid voltage gain 80 and input resistance = 10 k Ω is fed from an ideal source through a coupling capacitor of 0.22 μ F. Calculate :
(i) Lower cut-off frequency
(ii) Voltage gain at 400 Hz
(iii) The frequency at which gain is 20 dB down. [10]

9. (a) Write short notes on any *two* :
- (i) Crystal oscillator
 - (ii) Hartley oscillator
 - (iii) Wien Bridge oscillator. [8]
- (b) Explain the effect of negative feedback amplifier performance such as :
- (i) Gain
 - (ii) Input and output impedance
 - (iii) Sensitivity
 - (iv) Bandwidth. [8]

Or

10. (a) What are four basic amplifier types ? Explain with the help of block diagram. [8]
- (b) In a transistorized Hartley oscillator the two inductances are 2 mH and 20 μ H while the frequency is to be changed from 950 kHz to 2050 kHz. Calculate the range over which the capacitor is to be varied. [8]
11. (a) Show that the maximum conversion efficiency of the idealized class-B Push pull circuit is 78.5 percent. [8]
- (b) For distortion reading of $D_2 = 0.15$, $D_3 = 0.01$ and $D_4 = 0.05$ with $I_1 = 3.3$ A and $R_C = 4 \Omega$. Calculate :
- (i) Total harmonic distortion
 - (ii) Fundamental power component
 - (iii) Total power. [8]

Or

- 12.** (a) For a Class-B amplifier providing a 22 V peak signal to 8 Ω load and a power supply of $V_{CC} = 25$ V.

Find :

- (i) Input power
 - (ii) Output power
 - (iii) Circuit efficiency. [8]
- (b) Draw the circuit diagram of class B push-pull power amplifier and discuss in brief with the help of operation, merits and crossover distortion. [8]