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Semiconductor Devices and Circuits
(1050)

P. Pages : 4

Time : Three Hours **Max. Marks : 100**

Instructions to Candidates :
1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with blue ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. All questions are compulsory and carry equal marks.
5. Assume suitable data; if necessary.
6. Use of Non-programmable calculator is allowed.

UNIT – I

1. Solve **any two.** **20**

a) State Mass-Action Law. A bar of intrinsic silicon having a c/s area of $2.5\times10^{4}\,m^{2}$ has an electron density of $1.5\times10^{16}\,electrons/m^{3}$ If the electron mobility is $0.14m^{2}/v-sec$ and hole mobility is $0.05m^{2}/v-sec$ what is length of the bar in order to have a current of 1.2 mA when 9 volts are applied across its ends?

b) Derive the expression for ripple factor for a capacitor filter used with a full-wave rectifier circuit?
A $100\mu f$ capacitor when used as a filter has 12V dc across it with load resistance of 2.5K. If the rectifier is FWR. Calculate % ripple in the output?

c) Explain :

i) PIN photodiode

ii) Diode Capacitances.

UNIT – II

2. Solve **any two.** **20**

a) For the amplifier in fig. (1) find out
$A_{V_S} = V_O/V_S$, $A_{I_S} = I_O/I_S$, R_i, R_0^1
h – parameters are hie = 1K, hfe = 55.

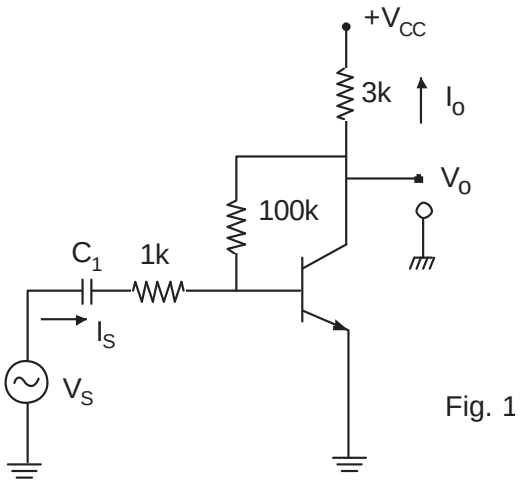

Fig. 1

b) For amplifier in fig (2) find out
hie and hfe if AV = -150, $R_i^1 = 1K$
assume hre = hoe = 0

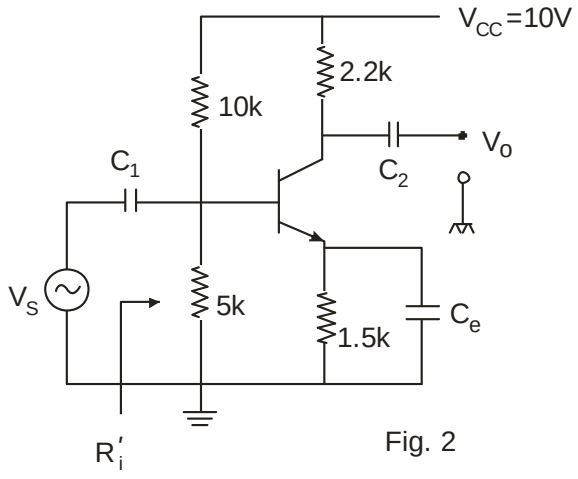

Fig. 2

c) Explain :

i) Temperature Compensation method

ii) Bootstrapped amplifier.

UNIT – III

3. Solve **any two.** **20**

a) For the FET shown in fig (3), find out the Q – points, if

$I_{DSS} = 18mA,\ V_P = 5V,\ V_{DD} = -20V \quad R_1 = 188K, R_2 = 47K,$

$R_D = 1.85K \quad R_3 = 1.65K$

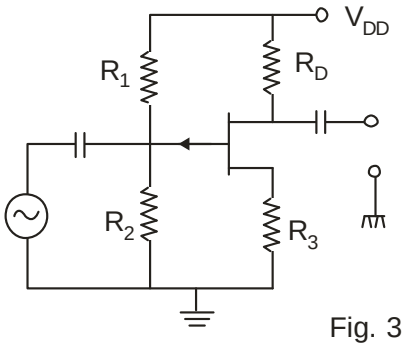

Fig. 3

b) For a FET amplifier shown in fig (4) find

i) $A_{VS} = V_0/V_S$ ii) R'_i iii) R'_0

If gm = $2m\mho$, rd = 50 K

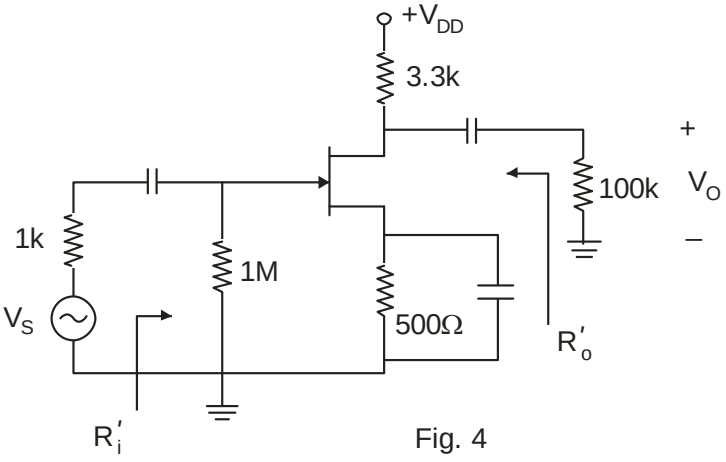

Fig. 4

c) Explain :

i) BJT Vs FET

ii) Drain characteristic of n – channel JFET.

UNIT – IV

4. Solve **any two.** **20**

a) With help of constructional Diagram, Explain operation of p-type Enhancement MOSFET?

b) Explain :
i) MOSFET Capacitance
ii) Noise Margine & Threshold Voltage.

c) With help of neat diagram, Explain Body effect in MOSFETS?

UNIT – V

5. Solve **any two.** **20**

a) Derive the equation for f_L and f_H for a transistor amplifier using a square wave testing method?

b) Explain the effect of coupling and By-pass of capacitors on bandwidth of amplifiers? What is the significance of Gain Bandwidth product?

c) For the amplifier shown in fig. (5) Obtain the high frequency response if $C_{bc} = 10pf$, $C_{be} = 1pf$
hie = 1.1K, hfe = 100 hre = hoe = 0.

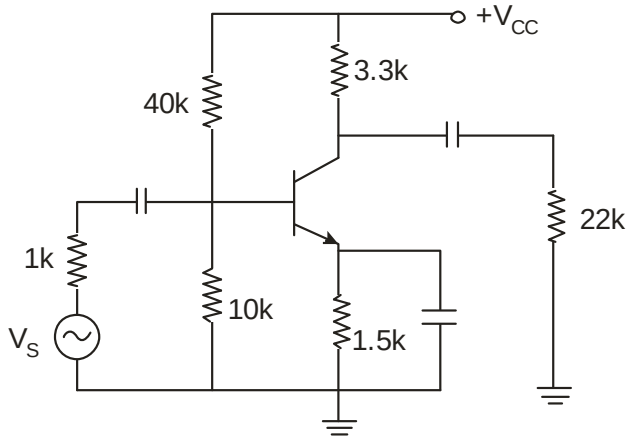

Fig. 5

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