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THIRD SEMESTER **B.Tech. (COE/SE/IT)**

SUPPLEMENTARY EXAMINATION *Feb-2019*

COE/SE/IT -261 ANALOG ELECTRONICS

Time: 3:00 Hours *Max. Marks : 40*

Note : Question number 1 is compulsory. Answer any **Four questions** from the rest. Assume suitable missing data, if any. All abbreviations have their usual meaning.

Q1. **(a)** If the emitter current of a transistor is 10 mA and the base current is 1/100 of collector current, determine the values of small-signal model parameters g_m and r_π of the transistor. 2

(b) Find the drain voltage for a fixed bias JFET circuit having V_{GS} = -3V, assuming I_{DSS}= 10mA, V_P = -5V, V_{DD}= 15V and R_D = 5KΩ? 2

(c) Explain the Barkhausen criterion of sustained oscillation. 2

(d) Determine the gain desensitivity factor for a feedback amplifier having open loop gain A =10^4 and closed loop gain A_f =10^3. 2

Q2. **(a)** For the circuit shown in Fig. 1 determine the value of V_C and I_E if β_F = 100. 4

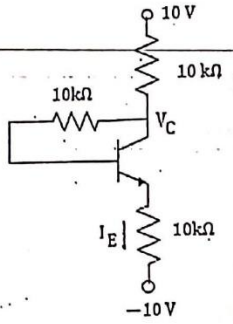

Fig. 1

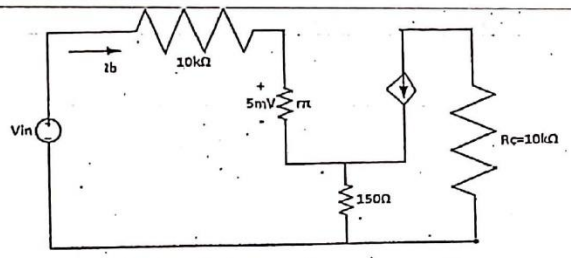

Fig. 2

(b) Analyze the circuit shown in Fig 2 and determine the input voltage (V_{in}) if the bias current I_{CQ} = 0.5 mA and β_F = β_0 =100. 4

Q3. **(a)** An enhancement type NMOSFET with V_t=2V, has its source terminal grounded and a 3V DC source connected to gate. Determine the region of operation of the device for V_D= 1V and the value of drain current if $\mu_n C_{ox}$ =20 μA/V² and W/L =100μm/10 μm. 3

Contd... 2

(b) Drawing the small signal circuit of CG amplifier determine the voltage gain, and input resistance of the amplifier 5

Q4. (a) Deduce the expression for input resistance for a shunt-shunt feedback amplifier. 3

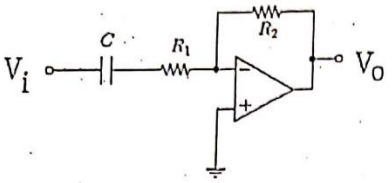

Fig. 3

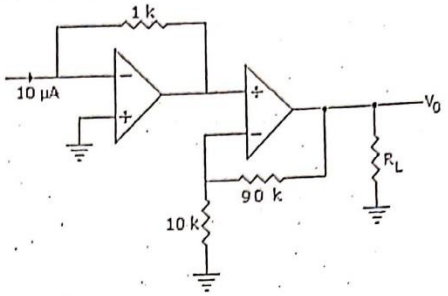

Fig. 4

(b) Derive the transfer function (V_o/V_i) for the circuit shown in Fig. 3. 3

(c) For the circuit shown in Fig. 4 determine the value of output voltage V_o. 2

Q5. (a) An enhancement type NMOSFET with V_t=2V, has its source terminal grounded and a 3V DC source connected to gate. Determine the region of operation of the device for V_D= 1V and the value of drain current if $\mu_n C_{ox}$=20 μA/V² and W/L =100μm/10 μm. 3

(b) Drawing the small signal circuit of CG amplifier determine the voltage gain, and input resistance of the amplifier 5

Q6. For the transistor amplifier shown in Fig. 5 assume R_1 = 16 kΩ, R_2 = 9 kΩ, R_C = 1kΩ, and R_E = 100 Ω, V_{CC} = 2.5V and $\beta_F = \beta_0$ = 100.

(a) Determine the Q point and identify the region of operation of transistor. 4

(b) Determine voltage gain (V_o/V_s) and input resistance (R_i) for the amplifier. 4

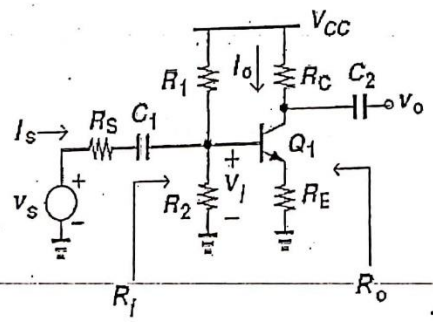

Fig.5

)(a)

or an NMOSFET with $L = 0.18\mu m$, $W = 2\mu m$, $C_{ox} = 0.2$

$C_{ox} = 8.6\,fF/\mu m^2$, $\mu_n = 450\,cm^2/V\text{-}s$, $V_t = 0.5\,V$.

Find V_{GS} & V_{DS} that results in NMOSFET operating at the edge of saturation with $I_D = 100\,\mu A$.

(b) ~~Common drain~~

Drawing the small signal circuit of CD amplifier determine the voltage gain and input resistance of the amplier.

)(5)(a)

For an NMOSFET with $L = 0.18\mu m$, $W = 2\mu m$, $C_{ox} = 0.2$

$C_{ox} = 8.6\,fF/\mu m^2$, $\mu_n = 450\,cm^2/V\text{-}s$, $V_t = 0.5\,V$.

Find V_{GS} & V_{DS} that results in NMOSFET operating at the edge of saturation with $I_D = 100\,\mu A$.

b) ~~Common drain~~

Drawing the small signal circuit of CD amplifier determine the voltage gain and input resistance of the amplier.