

(OLD COURSE)

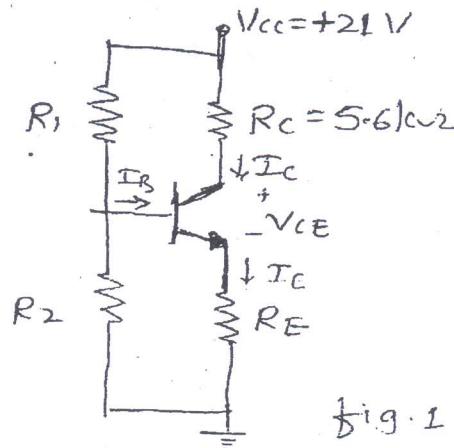
QP Code : 12249

(3 Hours)

[ Total Marks : 100

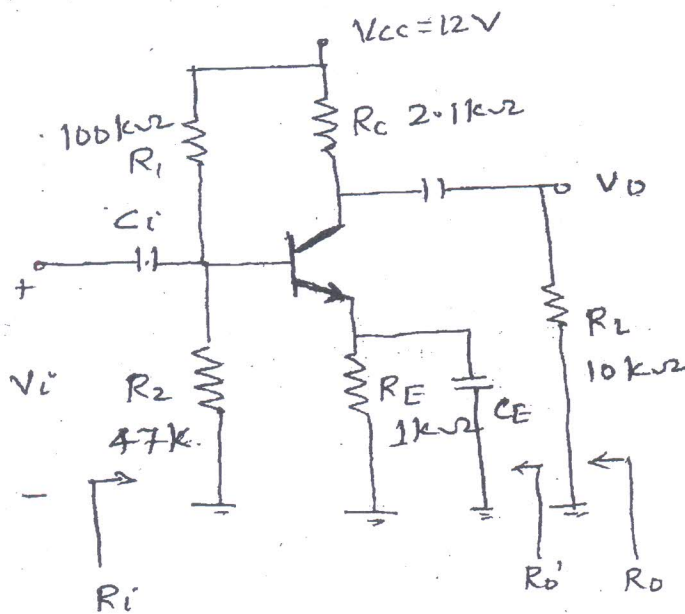
- N.B. : (1) Question No. 1 and 2 compulsory.  
 (2) Attempt any three question from The remaining question.  
 (3) In all five questions to be attempted.  
 (4) Figures to the right indicate full marks.

1. (a) Design single stage CE Amplifier to provide following specifications 15  
 $A_v \geq 150$ ,  $V_o = 3.5v$ ,  $F_L \leq 40$  Hz,  $S_{ICO} \leq 10$  use transistor BC147A.  
 (b) For the above designed amplifier find expected voltage gain, input impedance 5  
 output impedance and maximum undistorted output voltage and its corresponding input voltage.
2. (a) The circuit shown uses a silicon transistor with  $\beta=50$ ,  $V_{BE} = 0.6$  v,  $V_{CC} = 21$ v, 10  
 and  $R_C = 5.6$  k $\Omega$ . Find the values of the resistors  $R_E$ ,  $R_1$  and  $R_2$  so that Q point is set at  $V_{CE} = 12$ v and  $I_C = 1.5$  mA. The stability factor  $S \leq 3$ . (fig.1)



- (b) What are the important JFET parameters and define it from characteristics. 10
3. (a) Explain working of capacitor filter with full wave rectifier and derive the 10  
 expression for the ripple factor. Also explain the effect of load resistor on ripple factor.  
 (b) Design a zener shunt voltage regulator to meet the following specification 10  
 $V_o = 7$ v,  $I_L = 10$ mA,  $P_{zmax} = 500$ mw,  $I_{zmin} = 2$ mA, and  $V_i = 15 \pm 5$ v. 10

4. (a) Draw small signal hybrid parameter circuit for CE amplifier and define h-parameters from characteristics of transistor. 10
- (b) For the amplifier shown in figure. 2 below. Analyse and determine,  $A_v$ ,  $A_i$ ,  $R_i$  and  $R_o$ . 10



$$h_{ie} = 1.5k\Omega$$

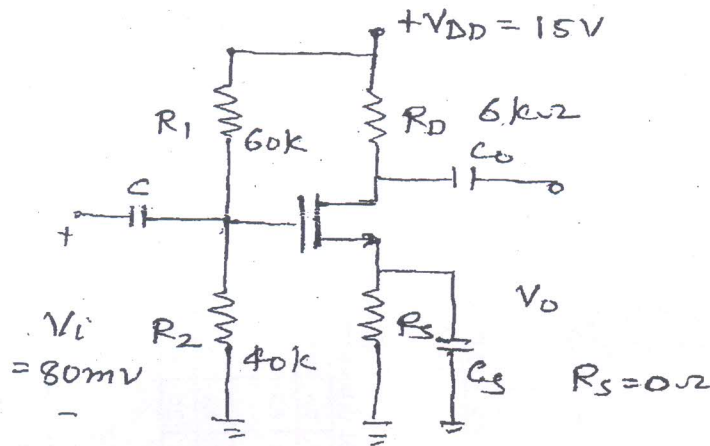
$$h_{fe} = 110$$

$$h_{re} = h_{oe} = 0$$

Fig. 2

5. (a) Draw common source amplifier with self bias circuit and derive the expression for voltage gain, input impedance and output impedance. 10
- What is the effect of removing bypass capacitor on voltage gain,  $R_i$  and  $R_o$ .
- (b) Explain with the help of neat circuit diagram, working of UJT relaxation oscillator and derive expression for frequency of oscillation. 10

6. (a) Compare JFETs and MOSFETs. 10  
 (b) An n-channel E-MOSFET with common source amplifier, shown in figure, has 10  
 the following parameters:  $I_{D(ON)} = 4\text{mA}$ , at  $V_{GS(ON)} = 8\text{V}$ ,  $V_{TN} = 4\text{V}$ .  $g_m = 2000$   
 $\mu\text{s}$ . Determine  $V_{GS}$ ,  $I_D$ ,  $V_{DS}$ , output voltage.  $R_i$  and  $R_o$ .



7. Explain the following (any four) 20
- Latching and holding current in SCR.
  - Bleeder resistance and critical inductance
  - Power MOSFET
  - Opto couples
  - BJT as a switch.

Transistor type	$P_{dmax}$ @ 25°C Watts	$I_{cm}$ @ 25°C Amps.	$V_{CE(sat)}$ volts d.c.	$V_{CE0}$ (Sus) volts d.c.	$V_{CE(sus)}$ (Sus) volts d.c.	$V_{CE0}$ (Sus) volts d.c.	$V_{CE(sus)}$ (Sus) volts d.c.	$V_{CE0}$ volts d.c.	$T_j$ max. °C	D.C. min	current. typ.	gain. max.	Small min.	Signal typ.	$h_{fe}$ max.	$V_{as}$ max.	$\theta_{jc}$ °C/W	Derate above 25°C W/°C
2N 3055	115.5	15.0	1.1	60	70	90	7	200	20	50	70	15	50	120	1.8	1.5	0.7	
ECN 055	50.0	5.0	1.0	50	55	60	5	200	25	50	100	25	75	125	1.5	3.5	0.4	
ECN 149	30.0	4.0	1.0	40	-	-	8	150	30	50	110	33	60	115	1.2	4.0	0.3	
ECN 100	5.0	0.7	0.8	60	65	-	6	200	50	90	280	50	90	280	0.9	35	0.05	
BC 147A	0.25	0.1	0.25	50	45	-	6	125	115	180	220	125	220	260	0.9	-	-	
2N 525 (PNP)	0.225	0.5	0.25	85	30	-	-	100	35	-	65	-	45	-	-	-	-	
BC 147 B	0.25	0.1	0.25	50	45	-	6	125	200	250	450	240	330	500	0.9	-	-	

Transistor type	$h_{ie}$	$h_{oe}$	$h_{re}$	$\theta_{jc}$
BC 147 A	2.7k $\Omega$	18 $\mu$ mho	$1.5 \times 10^{-4}$	0.4°C/mW
2N 525 (PNP)	1.4k $\Omega$	25 $\mu$ mho	$3.2 \times 10^{-4}$	-
BC 147B	4.5k $\Omega$	30 $\mu$ mho	$2 \times 10^{-4}$	0.4°C/mW
ECN 100	50 $\Omega$	-	-	-
ECN 149	15 $\Omega$	-	-	-
ECN 055	12 $\Omega$	-	-	-
2N 3055	6 $\Omega$	-	-	-

BFW 11-JFET MUTUAL CHARACTERISTICS

$-V_{gs}$ volts	$I_{ds}$ max. mA	$I_{ds}$ typ. mA	$I_{ds}$ min. mA	$T_j$ max. °C	D.C. min	current. typ.	gain. max.	Small min.	Signal typ.	$h_{fe}$ max.	$V_{as}$ max.	$\theta_{jc}$ °C/W
0.0	0.2	0.4	0.8	0.8	1.0	1.2	1.6	2.0	2.4	2.5	3.0	3.5
1.0	9.0	8.3	7.6	6.8	6.1	5.4	4.2	3.1	2.2	2.0	1.1	0.5
2.0	6.0	5.4	4.8	4.0	3.3	2.7	1.7	0.8	0.2	0.0	0.0	0.0
4.0	3.0	2.2	1.6	1.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0

N-Channel JFET

Type	$V_{DSmax}$ Volts	$V_{DGmax}$ Volts	$V_{GSmax}$ Volts	$P_d max$ @ 25°C mW	$T_j max$	$I_{DSS}$	$g_{m0}$ (typical) mho	$-V_p$ Volts	$r_d$	Derate above 25°C	$\theta_{jc}$
2N3822	50	50	50	300 mW	175°C	2 mA	3000 $\mu$ mho	6	50 K $\Omega$	2 mW/°C	0.58°C/mW
BFW 11 (typical)	30	30	30	300 mW	200°C	7 mA	5800 $\mu$ mho	2.5	50 K $\Omega$	-	0.61°C/mW