30/5/11

SE ETRX TV (Rev)
Electronic Circuit Analysis & Design

89-mk : 1stHf-11.

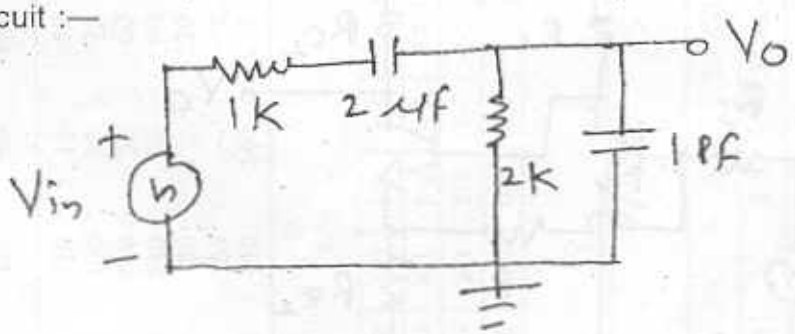
Con. 2946-11.

RK-1854

(3 Hours) **[Total Marks : 100**

N.B. (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** from remaining questions.
(3) Assume **suitable** data if **necessary**.

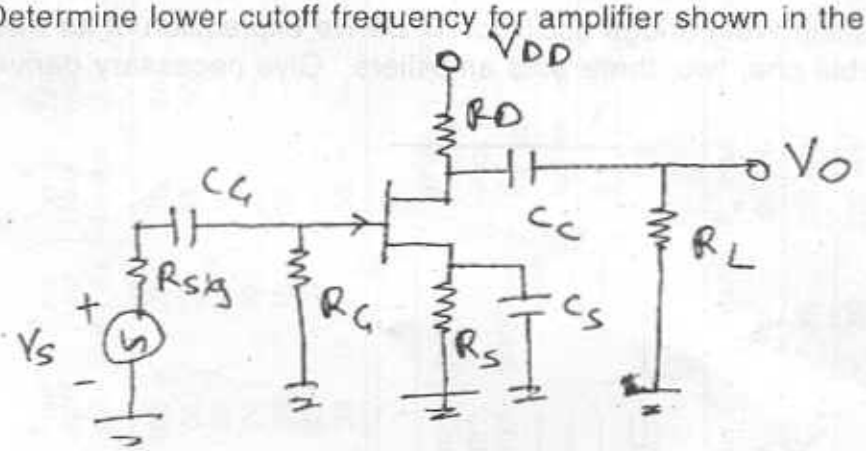
1. Attempt any **four** questions from the following :— **20**
   (a) State and prove Barkhausen criterion for sustained oscillations.
   (b) Write short notes on CASCODE amplifier.
   (c) Explain the use of swamping resistor in Differential Amplifier.
   (d) Explain design steps for Heat sinks.
   (e) For the following circuit, determine corner frequencies and bandwidth of the circuit :—



2. Design two stage RC coupled CE amplifier to provide $A_V = 3000$, $V_O = 2{\cdot}5$ V and S = 8. **20**
   Determine R_{in}, R_O, V_O of the amplifier you have designed.

3. Design class AB power amplifier for following specifications :— **20**
   $P_O = 12$ W, load resistance = 15 ohms, $V_{CC} = 12$ V,
   Calculate circuit efficiency, draw DC load line.
   Calculate power dissipation under zero signal conditions.

4. (a) Determine lower cutoff frequency for amplifier shown in the **figure** :— **14**



$C_G = 0{\cdot}01\ \mu F$
$R_{sig} = 10\ K\Omega$
$I_{DSS} = 8$ mA
$C_C = 0{\cdot}5\ \mu F$
$R_G = 1\ M\Omega$
$V_P = -4$ V

$C_S = 2\ \mu F$
$R_D = 4{\cdot}7\ K\Omega$
$R_S = 1\ K\Omega$
$R_L = 2{\cdot}2\ K\Omega$
$V_{DD} = 20$ V
$\gamma_d = \infty$

[TURN OVER

(b) Explain Miller effect in amplifiers. 6

5. For the amplifier shown in the **figure** determine :— 20

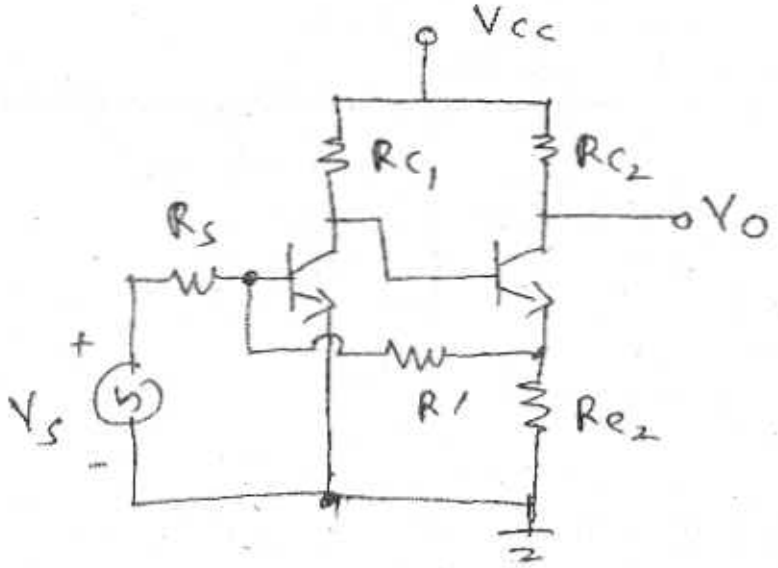
A Feedback factor β, A_{Vf}, Identify feedback type

B R_{in}, R_{inf}

C R_o, R_{of}

$RC_1 = 3$ K, $RC_2 = 500\ \Omega$, $R' = R_S = 1{\cdot}2$ KΩ

$RC_2 = 50\ \Omega$, $h_{ie} = 1{\cdot}1$ K, $h_{fe} = 50$, $V_{CC} = 15$ V.



Draw Equivalent circuit without feedback.

6. (a) Derive the expression of differential gain, common mode gain, CMRR for dual input balanced output differential amplifier. 10

(b) Derive the expression of $f\beta$ and fT. 10

7. (a) State and explain Wein bridge oscillator ? Derive expression of its frequency. 10

(b) Explain in detail one, two, three pole amplifiers. Give necessary derivations. 10

DBEC DATA SHEET

or type	Pdmax @ 25°C Watts	Icmax @ 25°C Amps	V_{CE}(sat) volts d.c.	V_{CBO} volts d.c.	V_{CEO} (Sus) volts d.c.	V_{CER} (Sus) volts d.c.	V_{CEX} volts d.c.	V_{BEO} volts d.c.	T_j max °C	D.C. current gain min	typ.	max.	Small Signal min.	typ.	h_{fe} max.	V_{BE} max.	θ_{j-c} °C/W	Derate above 25°C W/°C
)	115·5	15·0	1·1	100	60	70	90	7	200	20	50	70	15	50	120	1·8	1·5	0·7
5	50·0	5·0	1·0	60	50	55	60	5	200	25	50	100	25	75	125	1·5	3·5	0·4
9	30·0	4·0	1·0	50	40	—	—	8	150	30	50	110	33	60	115	1·2	4·0	0·3
0	5·0	0·7	0·6	70	60	65	—	6	200	50	90	280	50	90	280	0·9	35	0·05
	0·25	0·1	0·25	50	45	50	—	6	125	115	180	220	125	220	260	0·9	—	—
PNP)	0·225	0·5	0·25	85	30	—	—	—	100	35	—	65	—	45	—	—	—	—
	0·25	0·1	0·25	50	45	50	—	6	125	200	290	450	240	330	500	0·9	—	—

or type	hie	hoe	hre	θja
	2·7 K Ω	18μ ℧	1·5 × 10⁻⁴	0·4°C/mw
(PNP)	1·4 K Ω	25μ ℧	3·2 × 10⁻⁴	—
	4·5 K Ω	30μ ℧	2 × 10⁻⁴	0·4°C/mw
)	500 Ω	—	—	—
)	250 Ω	—	—	—
5	100 Ω	—	—	—
	25 Ω	—	—	—

BFW 11—JFET MUTUAL CHARACTERISTICS

−Vgs volts	0·0	0·2	0·4	0·6	0·8	1·0	1·2	1·6	2·0	2·4	2·5	3·0	3·5	4·0
Ids max. mA	10	9·0	8·3	7·6	6·8	6·1	5·4	4·2	3·1	2·2	2·0	1·1	0·5	0·0
Ids typ. mA	7·0	6·0	5·4	4·6	4·0	3·3	2·7	1·7	0·8	0·2	0·0	0·0	0·0	0·0
Ids min. mA	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	0·0

nel *JFET*

pe	V_{DS} max. Volts	V_{DG} max. Volts	V_{GS} max. Volts	P_d max. @25°C	T_j max.	I_{DSS}	g_{fs} (typical)	$-V_p$ Volts	r_d	Derate above 25°C	θ_{j-a}
	50	50	50	300 mW	175°C	2 mA	3000 μ℧	6	50 KΩ	2 mW/°C	0·59°C/mW
(typical)	30	30	30	300 mW	200°C	7 mA	5600 μ℧	2·5	50 KΩ	—	0·59° C/mW