E/SemTV/Biomed./Choice Based/LIC

23/5/18

(1)

Linear Integrated Circuits

(18)

Q.P. Code :37585

[Time: Three Hours] [Marks:80]

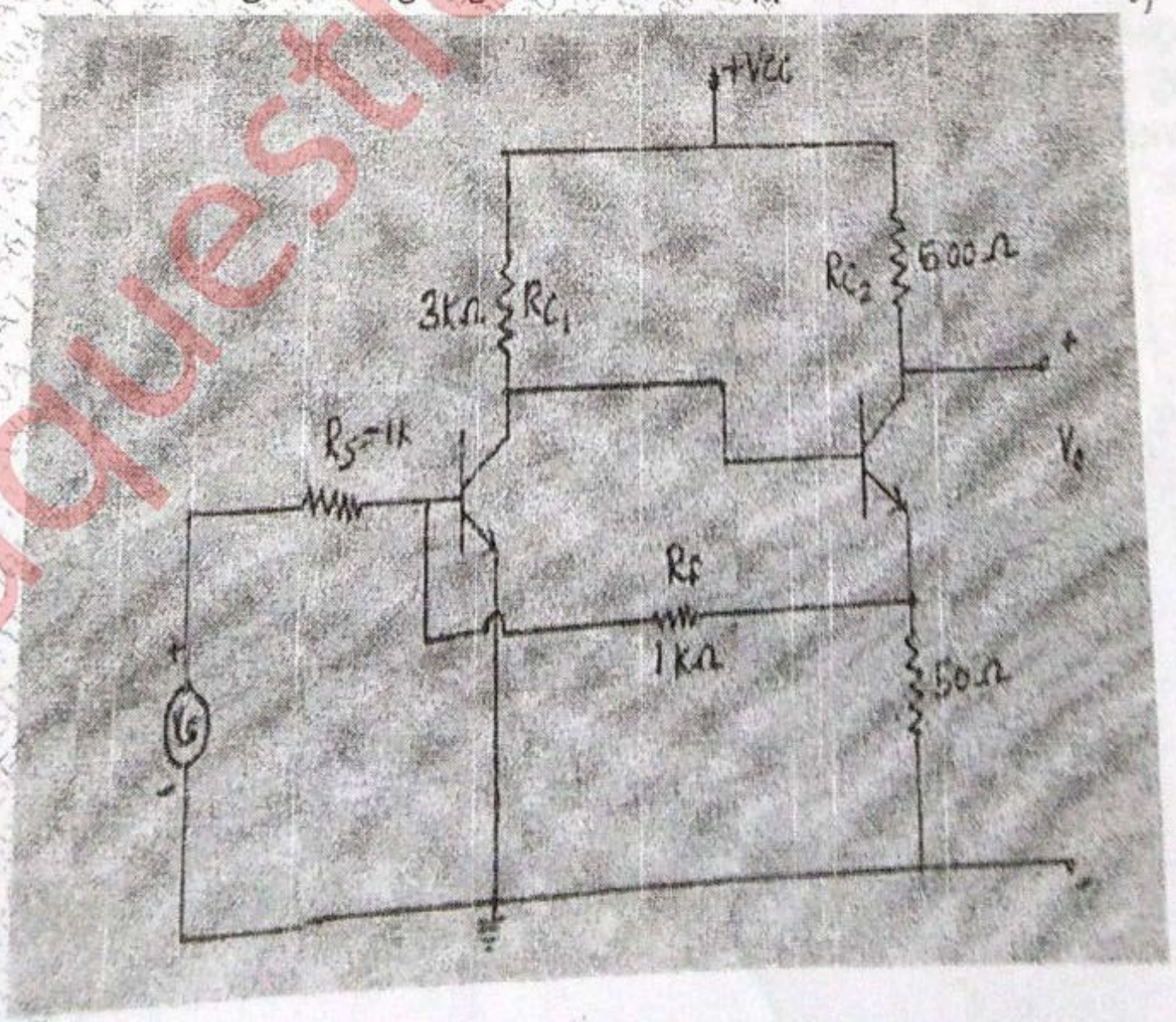
Please check whether you have got the right question paper.

N.B: 1) Q.1 is compulsory.
2) Attempt any three questions from remaining five questions.
3) Assume suitable data if necessary.

Q.1
a. Explain working of class C amplifier 05
b. Explain current mirror circuit used in differential amplifier. 05
c. Compare voltage series and voltage shunt feedback configurations. 05
d. A 50 KHz square wave is to be amplified by an op-amp to have an output voltage swing of ± 10 V. 05
Two op-amps are available.
i) $\mu A\ 741$ which has slew rate of $0.5V/\mu s$
ii) $TL081$ with S.R. of $13V/\mu s$.
Determine the suitability of the op-amp.

Q.2
a. Design a class A transformer coupled power amplifier for the following requirements. 10
Output ac power=5W , Dc supply voltage =12V, Load resistance =12Ω , $S_{Ico} \leq 8$
Calculate overall efficiency at full load.
b. Design a circuit using op-amp for the equation $V_o = -2V_1 - 4V_2 - 6V_3$ 05
c. Explain sample and hold circuit using op-amp. 05

Q.3
a. For the circuit shown in figure using negative feedback approach. Determine A_{v_f} R_{i_f} & R_{o_f}. 10



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b. In an Integrator circuit R_1=500 Ω , R_f=5k, C=0.1 μF. If input signal period is T=0.5 ms . Then find the frequencies f_a and f_b. Mark those frequencies on Integrator's frequency response. 05

c. Explain with neat m temperature compensated logarithmic amplifier. 05

Q.4 a. Draw and explain working of we in bridge oscillator. Derive frequency of oscillations and condition for sustained oscillations. 10

b. For a power MOSFET the thermal resistance parameters are as follows:- 05
$\theta_{dev-case}$ = 1.5°C/W , $\theta_{case-sink}$ = 1°C/W
$\theta_{sink-amb}$ = 6°C/W, $\theta_{case-amb}$ = 60°C/W
The ambient temperature is 28°C. The max junction or device temp is 100°C. Determine the max. Power dissipation in the transistor with and without heat sink.

c. Explain advantages of negative feedback used in amplifiers. 05

Q.5 a. Draw neat circuit diagram of 3 op-amp instrumentation amplifier. Derive relation of overall voltage gain. State its specifications and mention its use. 10

b. Explain following terms. 06
1) CMRR 2) Slew rate 3) Input offset voltage.
State its ideal and practical values.

c. Explain peak detector circuit using op-amp. 04

Q.6 a. The following specifications are given for the dual input balanced output differential amplifier of R_c=2.2k, R_E=4.7k, Rin_1=Rin_2=50 Ω, ±Vcc = 10V, βac = βdc = 100, V_{BE} = 0.715V. Determine I_{CQ} , V_{CEQ} , Ad and Ac. 10

b. Design a circuit using op-amp for the following equation:- 05
$V_o = \int Vin.dt.$

c. With neat diagram explain Schmitt trigger circuit. 05

DBEC DATA SHEET

Transistor type	P_{dmax} @ 25°C Watts	I_{cmax} @ 25°C Amps	$V_{ce\,sat}$ volts d.c.	V_{ceo} volts d.c.	V_{cer} (5ΩΩ) volts d.c.	V_{cex} (5ΩΩ) volts d.c.	V_{cex} volts d.c.	V_{ceo} volts d.c.	T_j max °C	D.C. current gain min	typ.	max.	Small Signal h_{fe} min.	typ.	max.	V_{ce} max.	θ_{j-c} °C/W	Derate above 25°C W/°C
2N 3055	115·5	15·0	1·1	100	60	70	90	7	200	20	50	70	15	50	120	1·8	1·5	0·7
RCN 055	50·0	5·0	1·0	60	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	50	40	—	—	8	150	30	50	110	33	60	115	1·2	4·0	0·3
ECN 100	5·0	0·7	0·6	10	60	65	—	6	200	50	90	260	50	90	280	0·9	35	0·05
BC147A	0·25	0·1	0·25	50	45	50	—	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	—	—	—	—
BC147B	0·25	0·1	0·25	50	45	50	—	6	125	200	290	450	240	330	500	0·9	—	—

Transistor type	h_{ie}	h_{oe}	h_{rc}	θ_{j-a}
BC 147A	2·7 K Ω	18μ ℧	$1·5 \times 10^{-4}$	0·4°C/mw
2N 525 (PNP)	1·4 K Ω	25μ ℧	$3·2 \times 10^{-4}$	—
BC 147B	4·5 K Ω	30μ ℧	2×10^{-4}	0·4°C/mw
BCN 100	50 Ω	—	—	—
ECN 149	15 Ω	—	—	—
RCN 055	12 Ω	—	—	—
2N 3055	6 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

N-Channel JFET

Type	V_{os} max. Volts	V_{ds} max. Volts	V_{gs} max. Volts	P_d max. @25°C	T_j max.	I_{dss}	Z_{os} (typical)	-V_p Volts	r_d	Derate above 25°C	θ_{j-a}
2N3822	50	50	50	300 mW	175°C	2 mA	3000 μ ℧	6	50 KΩ	2 mW/°C	0·59°C/mW
BFW 11 (typical)	30	30	30	300 mW	200°C	7 mA	5600 μ ℧	2·5	50 KΩ	—	0·59° C/mW