S.E- IV Sem · Biomed· 27/5/15

~~Electronic~~ ~~Instruments & Control systems~~

(19)

BM/IV/CBGS/ECAD-II

Q.P. Code : 3579

Electronic Circuits Analysis & Design - II

(3 Hours) [Total Marks : 80

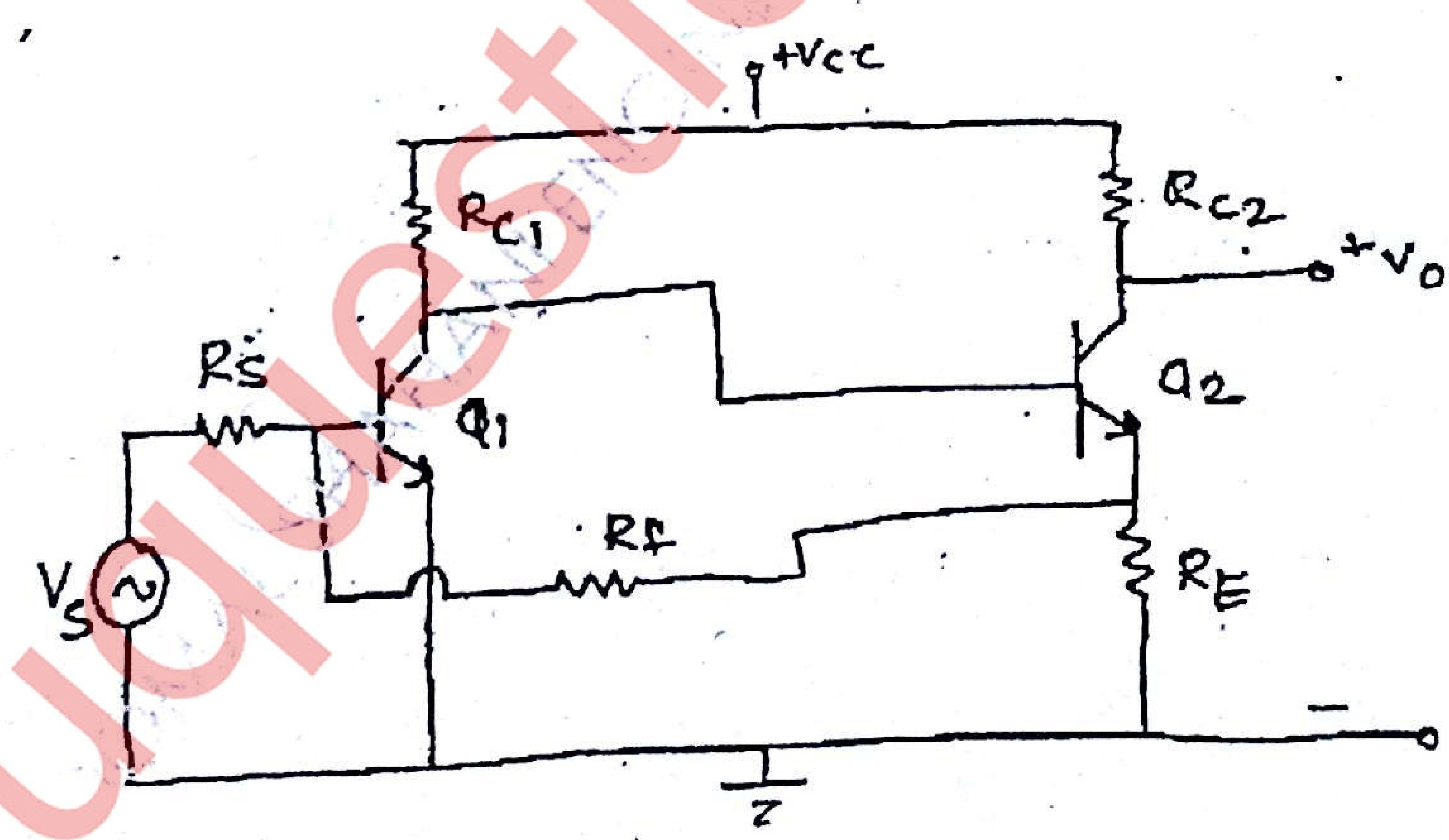
N.B. : (1) Question No. 1 is compulsory.
(2) Attempt any three questions out of remaining five questions.
(3) Assume suitable data wherever necessary.

1. (a) Derive Barkhaunsen's criteria for oscillations. 5
(b) Explain zero crossing detector. 5
(c) Give design steps for Heat sink used in power amplifiers. 5
(d) Explain precision rectifier using Op-amp. 5

2. (a) Compare LC and RC oscillators. Draw Hartley oscillator and derive expression for frequency of oscillation and condition for oscillations. 10
(b) Design class A transformer coupled power amplifier for output power of 15W to the speaker of 12 Ω. 10

3. (a) Write characteristics of instrumentation Amplifier. Derive gain formula of 3 op-Amp instrumentation amplifier. 10
(b) Design Wein bridge oscillator for output frequency, f = 8khz. 5
(c) Design a schmitt trigger for $V_{UT} = 4V$, $V_{LT} = -4V$, $V_{CC} = V_{EE} = \pm 15V$ 5

4. (a) Calculate Avf, Rif and Rof. 10



hfe = 50, Rf= 1.2k Ω, Rc_1 = 3kΩ, RE = 50Ω hie = 1.1 k Ω, Rs = 1.2 k Ω, Rc_2 = 500 Ω.

(b) Draw monostable multivibrator and explain its operation with waveforms. 10

TURN OVER

27/5/15

2

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5. (a) Derive relations for DC and AC analysis of single input unbalanced output differential Amplifier. 10

(b) For the following given specifications for Dual input balanced output differential amplifier. 10

$R_C = 3.3k\ \Omega$, Rin1 = Rin2 = 100 Ω.

$R_E = 1\ k\ \Omega$

$V_{CC} = V_{EE} = |20V|$

βdc = βac = 100

VBE = 0.7V

Calculate :

(i) I_C & V_{CEQ}

(ii) Ad

(iii) Ac

(iv) CMRR

(v) Ri & Ro

6. (a) Explain Block diagram of Op-amp. 5

(b) Design following circuit using Op-amp to obtain following outputs. 10

(i) Vo = -3Va + 2Vb - 5Vc + Vd

(ii) $Vo = \frac{-dvin}{dt}$

(c) Compare current shunt and current series negative feedback using op-Amp. 5

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DATA SHEET

Transistor type	P_d max @ 25°C Watts	I_c max @ 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_{EBO} volts d.c.	T_j max °C	D.C. current gain min	typ.	max.	Small signal h_{fe} min.	typ.	max.	V_{BE} max.	θ_{jc} °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
ECN 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	70	60	65	—	6	200	50	90	280	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_{re}	θ_{ja}
BC 147A	2.7 K Ω	18 μ ℧	1.5 × 10^{-4}	0.4°C/mw
2N 525 (PNP)	1.4 K Ω	25 μ ℧	3.2 × 10^{-4}	—
BC 147B	4.5 K Ω	30 μ ℧	2 × 10^{-4}	0.4°C/mw
ECN 100	50 Ω	—	—	—
ECN 149	15 Ω	—	—	—
ECN 055	12 Ω	—	—	—
2N 3055	6 Ω	—	—	—

BFW 11–JFET MUTUAL CHARACTERISTICS

$-V_{GS}$ 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
I_{DS} 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
I_{DS} typ. mA	7.0	6.2	5.4	4.6	4.0	3.3	2.7	1.7	0.8	0.2	0.0	0.0	0.0	0.0
I_{DS} 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_{DS} max. Volts	V_{DG} max. Volts	V_{GS} max. Volts	P_d max. @ 25°C	T_j max.	I_{DSS}	g_{mo} (typical)	$-V_p$ Volts	r_d	Derate above 25°C	θ_{jc}
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