S.E - IV Sem - Biomed
Electronic Circuits Analysis & Design - II
(1) (19)

04/12/2015

SE/IV/CBGS/BM/ECAD-II

QP Code : **5407**

(3 Hours) [Total Marks :80

N.B. : (1) Question no. 1 is compulsory.
(2) Attempt any three questions from the remaining five questions.
(3) Assume suitable data if required.

1. (a) With definitions, ideal values and practical values explain CMRR and slew rate of op-amp 741 — 5
(b) Compare class A and class B power amplifier — 5
(c) Explain current mirror circuit used in differential amplifier — 5
(d) Give characteristics of negative feedback — 5

2. (a) Design class A transformer coupled power amplifier to obtain 6w output to $10\,\Omega$ load. — 10
(b) With neat diagram derive voltage gain formula for 3 op-amp instrumentation amplifier Explain its characteristics. — 10

3. (a) Derive frequency of oscillations and condition for sustained oscilations for wein bridge oscilatior along with ckt diagram. — 10
(b) For the following given specifications for DIBO differential amplifier — 10
$R_C = 3.3k$, $V_{BE} = 0.7V$,
$R_{in1} = R_{in2} = 100\,\Omega$, $R_E = 1k$,
$V_{CC} = V_{EE} = |20V|$, $\beta_{ac} = \beta_{dc} = 100$
Calculate I_C, V_{CEQ}, A_d, A_c, CMRR, R_i, R_o.

4. (a) Design RC phase shift oscillator for f = 1KHz — 5
(b) Design op-amp based ckt for $V0 = -(2V_1 + 4V_2 + 6V_3)$ — 5
(c) Design a circuit using op-amp.

$$V_0 = -\int_0^{+} V_{in}\,dt$$

— 5
(d) Write design steps for heat sink

5. (a) Explain the advantages of negative feedback. Compare any two types of negative feedback circuits deriving its components. — 10
(b) Derive relations of dc and ac analysis of Dual Input Unbalanced Output differential amplifier. — 10

6. (a) Write short notes on the following (any two):- — 20
(i) Precision Rectifier (Half wave and Full wave rectifier)
(ii) Gyrator
(iii) Log and antilog amplifier

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MD-Con. 9927-15.

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DATA SHEET

Transistor 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_{EBO} volts d.c.	T_j max °C	D.C. current gain min	typ.	max.	Small Signal min.	typ.	f_T 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	360	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	hie	hoe	hre	θja
BC 147A	2.7 K Ω	18μ ℧	1.5 × 10⁻⁴	0.4°C/mw
2N 525 (PNP)	1.4 K Ω	25μ ℧	3.2 × 10⁻⁴	—
BC 147B	4.5 K Ω	30μ ℧	2 × 10⁻⁴	0.4°C/mw
ECN 100	500 Ω	—	—	—
ECN 149	250 Ω	—	—	—
ECN 055	100 Ω	—	—	—
2N 3055	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

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