SE - IV - R2012/CBSGS - BIO - ECD II - 08/12/16 - 3 7

Q.P. Code : 534402

(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

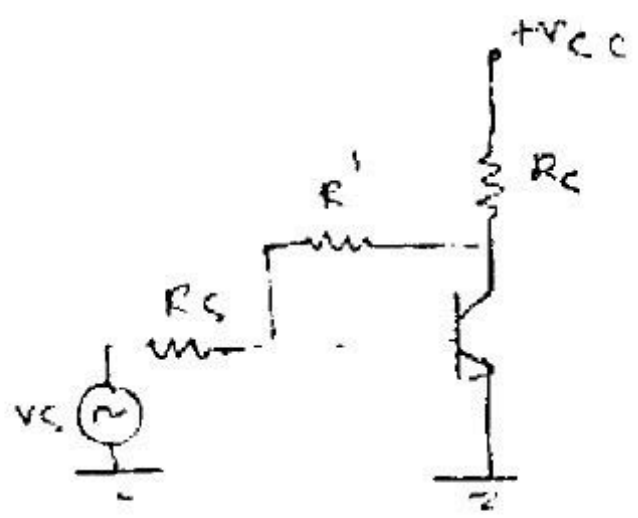
1. Answer the following questions.
   (a) Explain cross-over distortion. **5**
   (b) Explain precision full wave rectifier using op-amp **5**
   (c) Compare RC phase shift and wein Bridge oscillator **5**
   (d) Compare current series and current shunt negative feedback using op-amp **5**

2. (a) Derive frequency of oscillations and condition for sustained oscillations for RC phase shift oscillator along with circuit diagram **12**
   (b) Design op-amp based circuits for **8**
   (i) $V_0 = -2V_1 - 4V_2 + 3V_3$
   (ii) $V_0 = +\frac{dvin}{dt}$

3. (a) For the following given specifications for DIBO. Differential amplifier **10**
   Calculate I_C, V_{CEQ}, Ad, AC, CMRR, R_i, R_o
   Given : $R_C = 3.8k\Omega$, $V_{BE} = 0.5V$, $Rin_1 = Rin_2 = 150\Omega$, $\beta ac = \beta dc = 90$
   $R_E = 1.2K$
   (b) Draw and explain Block diagram of op-amp **5**
   (c) Design a schmitt trigger for $V_{UT} = 4V$, $V_{LT} = 3V$, $V_{CC} = V_{EE} = \pm 15V$ **5**

4. (a) Design 3 op-amp Instrumentation amplifier for gain $A_{VT} = 600$. **5**
   (b) Design a class B push pull power amplifier deliver a peak power of 3 watts into a resistive load of 12Ω with low distortion. Assume supply voltage = 24V. **15**

5. (a) Identity the type of negative feedback used in below circuit and find Avf, Rif and Rof **10**



$R_C = 4k\Omega$

$R' = 40k\Omega$

$R_S = 10k\Omega$

$h_{ie} = 1.1k\Omega$

$h_{fe} = 50$

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

(b) Explain concept of virtual ground in op-amp **5**

(c) Draw and explain a circuit to convert sine wave into square wave. **5**

6. Write short notes on (Any **Four**) **20**

(a) Peak detector using op-amp

(b) Practical Integrator

(c) Heat sink and its design steps

(d) Antilog Amplifier

(e) Constant current source circuit used in differential amplifier

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_{ces} (Sus) volts d.c.	V_{cer} volts d.c.	V_{ebo} volts d.c.	T_{j} max °C	D.C. current gain min.	typ.	max.	Small Signal min.	typ.	h_{fe} 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
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	200	50	90	280	0·9	35	0·05
BC147A	0·25	0·2	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	—	65	—	—	—	—
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_{j-a}
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

−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	7·6	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
I_{DS} min. mA	4·0	3·9	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_{GS} max. Volts	V_{DS} max. Volts	V_{GS} max. Volts	P_{t} max. @25°C	T_{j} max.	I_{DSS}	g_{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

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