Con. 5242-09. (REVISED COURSE) SP–7784

S.E. (ETRX) Sem IV (R) 14/12/09

(3 Hours) [Total Marks : 100

Electronic Circuit Analysis & Design

N.B. : (1) Question No. **1** is **compulsory**.

(2) Attempt any **four** questions from question Nos. **2** to **7**. 2.30 to 5.30

(3) Assume **suitable** data wherever necessary with proper **justification**.

(4) **Figure** to the **right** indicatae **full** marks.

1. Attempt any **four** of the following :– **20**

(a) Design a circuit to have sine wave with f = 2kHz without giving any input signal.

(b) State the methods to improve CMRR of an Differential Amplifier. Explain any one.

(c) Three non-identical amplifiers are cascaded together with following parameters,

Av_1 = 40 db, Bw_1 = 40 Hz to 100 kHz

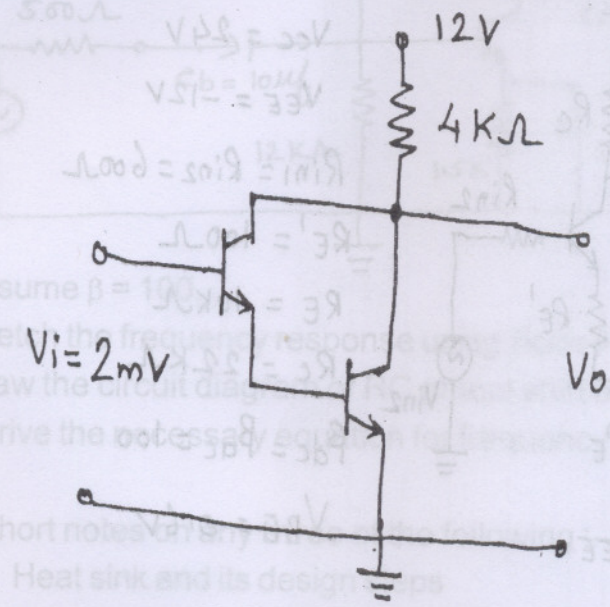
Av_2 = 42 db, Bw_2 = 35 Hz to 200 kHz

Av_3 = 38 db, Bw_3 = 45 Hz to 150 kHz.

Determine the voltage gain and Bandwidth of the Cascaded Amplifier.

(d) Explain the advantaes of class AB amplifier over class B amplifier with suitable waveforms.

(e) Determine output voltage for the following **circuit**,



Assume,

hfe = 100,

hie = 1.2KΩ

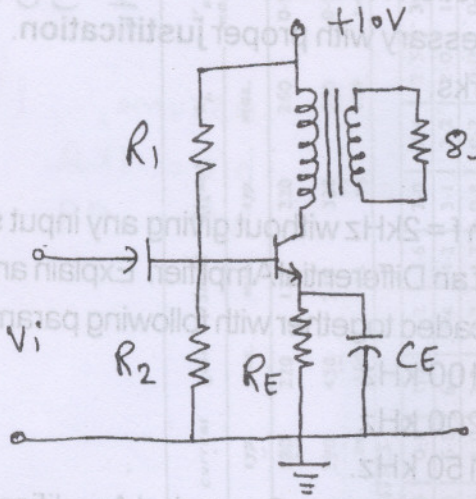
2. Design a two stage RC coupled cascaded amplifier for the following requirements : **20**

$A_V \geq 1000$, $V_0 = 3\,V_{peak}$, $R_i > 100\,k\Omega$, F_L better than 20 Hz.

[TURN OVER

3. (a) Design a class A power amplifier to provide 3W power to a speaker of 4 Ω. **12**

(b) Calculate the ac power delivered to the 8 Ω speaker, dc input power, power dissipated by the transistor and efficiency of the circuit shown in **figure**. **8**



$V_{CEQ} = 10V$

$I_{CEQ} = 140mA$

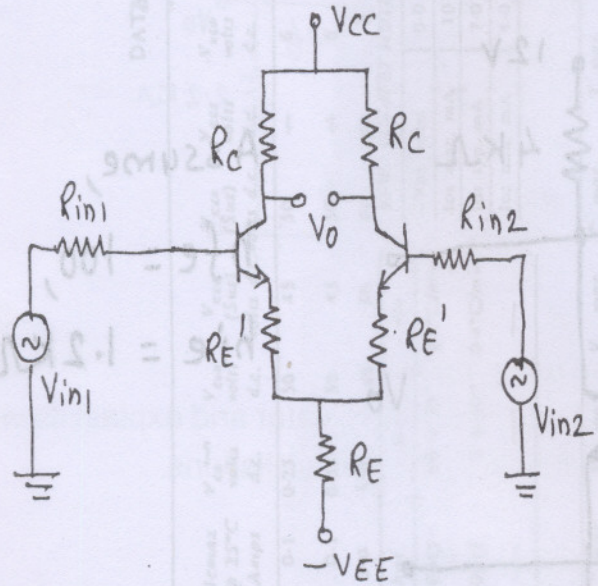
$V_{CE\,min} = 1.7V$

$V_{CE\,max} = 18.3V$

$I_{C\,min} = 25mA$

$I_{C\,max} = 255mA$

4 (a) For the circuit shown in **figure**, determine the quiscent current ICQ, voltage VCEQ and differential gain Ad. **10**



$V_{CC} = 24V$

$V_{EE} = -12V$

$R_{in1} = R_{in2} = 600\Omega$

$R_E' = 100\Omega$

$R_E = 10K\Omega$

$R_C = 22K\Omega$

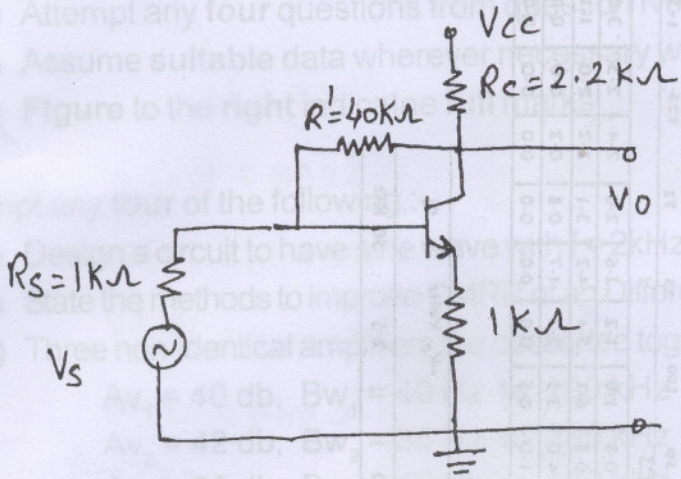
$\beta_{dc} = \beta_{ac} = 100$

$V_{BE} = 0.6V$

(b) Explain the high frequency analysis of a BJT amplifier. Derive necessary expressions and show the two pole Bode Plot of the same. **10**

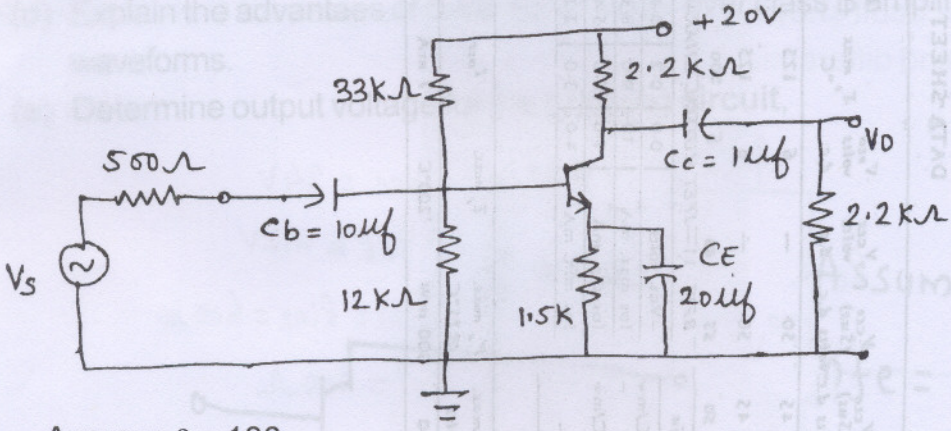
5. (a) State the advantages of negative feed back on performance of amplifier. 10
Compare various types of negative feed back.

(b) For the circuit shown in **figure**, determine A_{vf}, A_{if}, R_{if} and R_{of}. 10



Assume,
hie = 1kΩ
hfe = 99

6. (a) Determine the lower cutoff frequency of the network of **figure** below : 10



Assume $\beta = 100$.
Sketch the frequency response using Bode Plot.

(b) Draw the circuit diagram of RC phase shift oscillator and explain its working. 10
Derive the necessary equation for frequency of oscillations.

7. Write short notes on any **three** of the following :– 20
   (a) Heat sink and its design steps
   (b) Nyquist stability criteria to estimate stability of an amplifier
   (c) Crystal oscillator
   (d) Comparison of small signal and large signal amplifiers
   (e) Differential amplifier with active load.

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_{ceo} (Sus) volts d.c.	V_{ces} (Sus) volts d.c.	V_{ces} volts d.c.	V_{eto} volts d.c.	T_j max °C	D.C. current gain min.	typ.	max.	Small Signal h_{fe} min.	typ.	max.	V_{ce} sat max.
BC147A	0·25	0·1	0·25	50	45	50	—	6	125	115	180	220	125	220	260	0·9
BC147B	0·25	0·1	0·25	50	45	50	—	6	125	200	290	450	240	330	500	0·9
ECN055	30·0	5·0	1·0	60	50	55	60	5	200	25	50	100	25	75	125	1·5

Transistor type	h_{ie}	h_{oe}	h_{re}	θ_{ja}
BC 147A	2·7 KΩ	18µ℧	$1·5 \times 10^{-4}$	0·4°C/mW
BC 147B	4·5 KΩ	30µ℧	2×10^{-4}	0·4°C/mW
ECN055	30 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	6·0	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	3·0	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_{oc} max. Volts	V_{cs} max. Volts	P_d max. @25°C	T_j max.	I_{DSS}	g_{fs}	$-V_p$ Volts	r_d
BFW 11 (typical)	30	30	30	300 mW	200°C	7 mA	5000 µ℧	2·5	50 KΩ