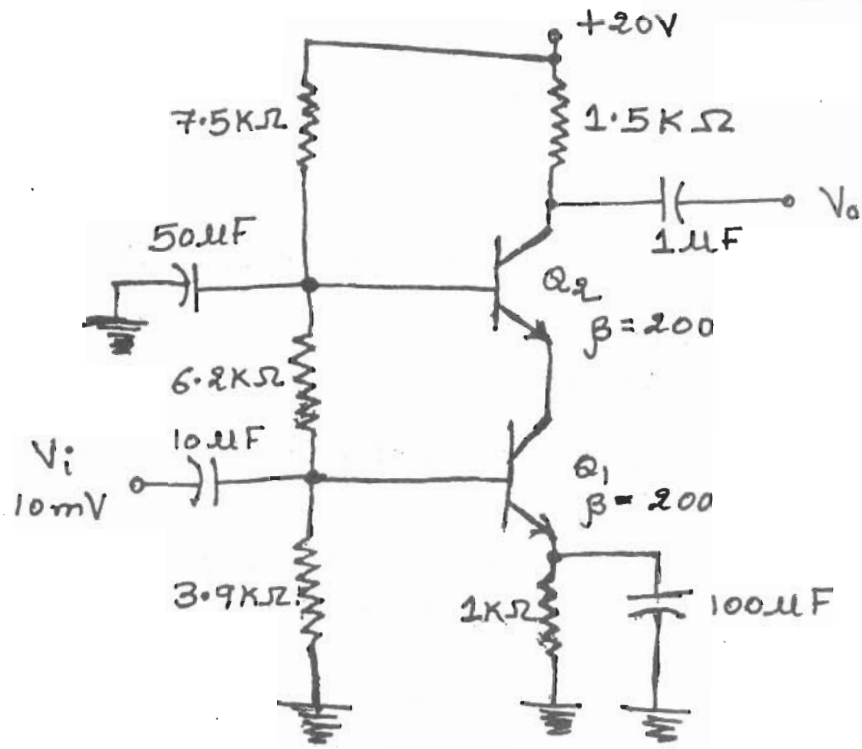
V SE / ETRX / IV (Rev) 25/5/2012
Electronic Circuit Analysis & Design

Con. 4022-12. **GN-5532**

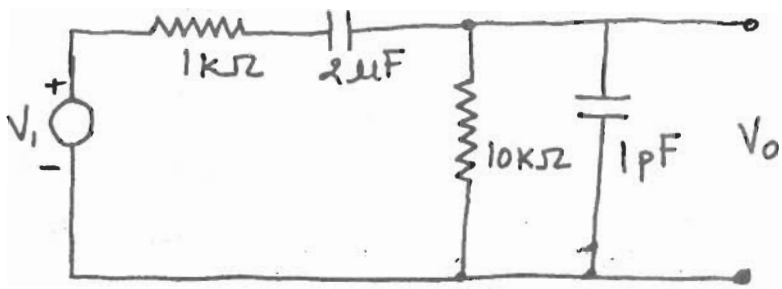
(3 Hours) **[Total Marks : 100**

N.B. : (1) Question No. **1** is **compulsory.**
(2) Attempt any **four** questions from Question Nos. **2** to **7.**
(3) Assume **suitable** data wherever **necessary** with proper **justification.**
(4) **Figures** to the **right** indicates **full** marks.

1. Attempt any **four** of the following :— **20**
   (a) Explain differential amplifier with active load.
   (b) What is cross over distortion in class B power amplifier explaining with waveform ?
   (c) State advantages of negative feedback on performance of amplifier.
   (d) For the circuit given below calculate dc bias voltages V_{B1}, V_{B2} and V_{C2}.



   (e) For the circuit given below determine the 3dB frequencies and bandwidth.



2. Design a two stage RC coupled amplifier for following requirements : F_L better than 15 Hz, Av ≥ 1500, S_{Ic} < 8, R_i ≥ 1MΩ, V_{CC} = 6V. **20**

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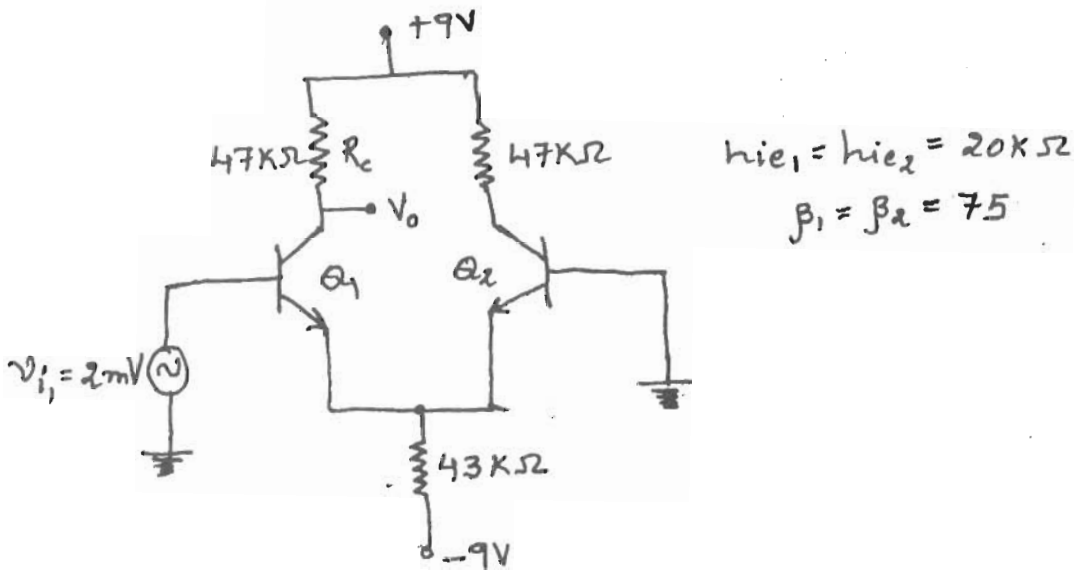
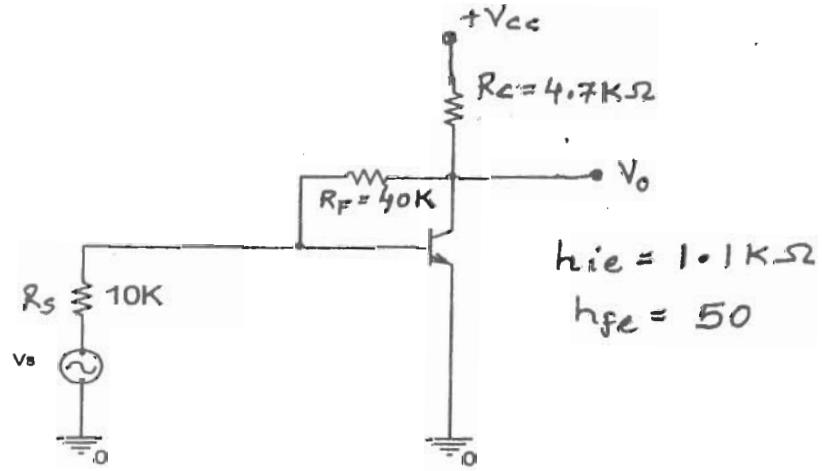
3. (a) Explain Class B Push Pull amplifier & derive the expression for maximum efficiency. 10
   (b) For the given differential amplifier determine dc voltages, currents and single ended output voltage V_{01}. 10

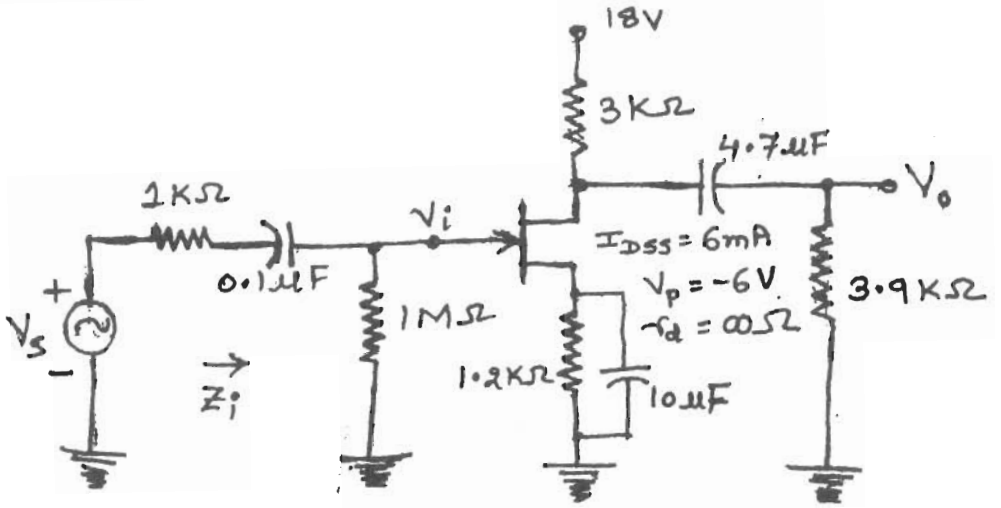


4. (a) For a class B amplifier with V_{CC} = 20 V driving an 16 Ω load, Determine :— 10
   (i) Maximum input power,
   (ii) Maximum output power,
   (iii) Maximum circuit efficiency,
   (iv) Transistor dissipation.
   (b) Explain the high frequency analysis of a BJT amplifier. Derive necessary expressions. 10

5. (a) Draw the circuit diagram of Wein bridge oscillator and explain its working. Derive the necessary equation for frequency of oscillations and for sustaining oscillations. 10
   (b) For the following circuit determine A, β, A_f, Z_{if}, Z_{of} and A_{vf}. 10



6. (a) Determine the lower cutoff frequency for the following network. 10



(b) For a current series negative feedback amplifier derive the expression for the input and output resistances with feedback and comment on the result. 10

7. Write short note on any three :— 20

(a) Heat Sink and its design steps
(b) CMRR improvement in differential amplifier
(c) Nyquist stability criterion
(d) Crystal Oscillator.

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Transistor type	P_{dmax} @ 25°C Watts	I_{cmax} @ 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_{BEO} volts d.c.	T_j max. °C	D.C. current gain min	typ.	max.	Small Signal min.	typ.	h_{fe} max.	V_{BE} max.	θ_{ja} °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
BC 147A	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	–	–	–	–
BC 147 B	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 147 A	2.7kΩ	18μmho	1.5×10^{-4}	0.4°C/mW
2N 525 (PNP)	1.4kΩ	25μmho	3.2×10^{-4}	—
BC 147B	4.5kΩ	30μmho	2×10^{-4}	0.4°C/mW
ECN 100	50Ω	–	—	—
ECN 149	15Ω	–	—	—
ECN 055	12Ω	–	—	—
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	6.0	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	$V_{DS\ max.}$ Volts	$V_{DG\ max.}$ Volts	$V_{GS\ max.}$ Volts	$P_{d\ max.}$ @ 25°C	$T_{J\ max.}$	I_{DSS}	g_{fs} (typical)	$-V_p$ Volts	r_d	Derate above 25°C	θ_{ja}
2N3822	50	50	50	300 mW	175°C	2 mA	3000 μ mho	6	50 KΩ	2 mW/°C	0.59°C/mW
BFW 11 (typical)	30	30	30	300 mW	200°C	7 mA	5800 μ mho	2.5	50 KΩ	—	0.59°C/mW