S.E -IV Sem - Bomed. 25/5/16

25/05/2016

SE/IV/CBGS/BM/ECAD-II

Q.P. Code : 534401

Electronic Circuits analysis & Design - II

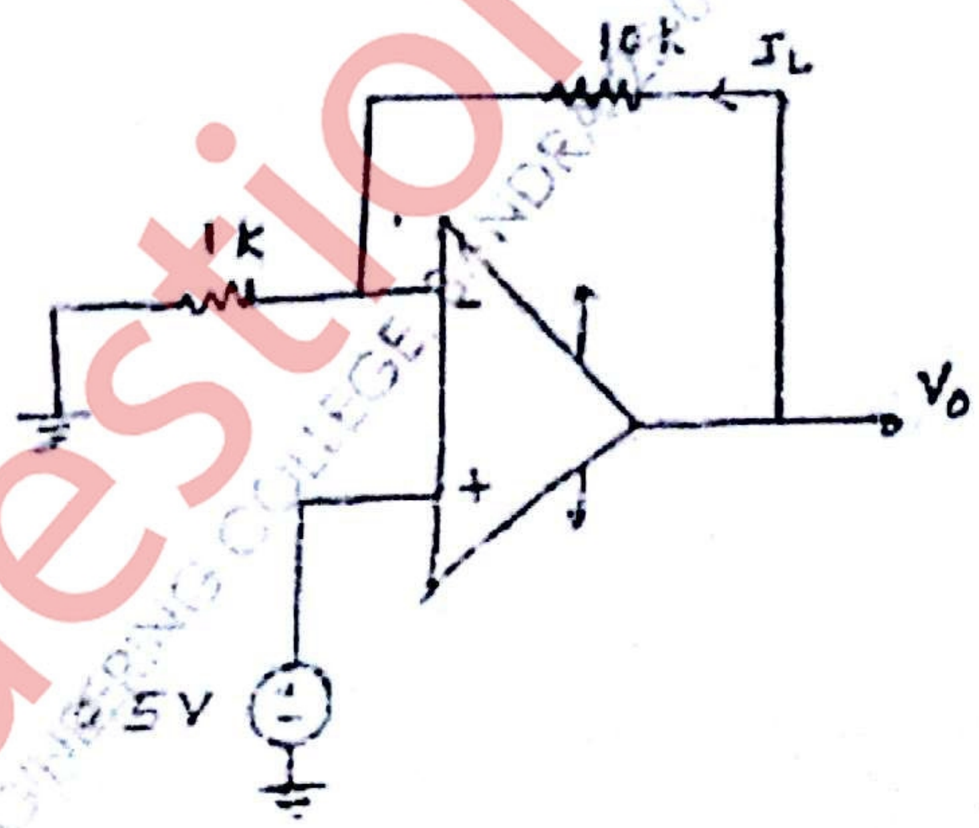
(19)

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

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. **20**
   (a) State and prove Barkhausen's criterion for producing oscillations.
   (b) With neat circuit diagram and waveforms, explain zero crossing detector.
   (c) Differentiate complementary-symmetry and push-pull configuration used in power amplifier.
   (d) Explain the importance of swamping resistance used in differential amplifier.

2. (a) Using practical op-amp realize, $V_0 = 5V_1 + 3V_2 - V_3$ **5**
   (b) For the circuit shown in figure, find I_L. If 10k Ω resistance is replaced by 20 kΩ. Find I_L. Assume $\pm V_{sat} = \pm 13V$ **5**



   (c) For an RC phase shift oscillator, the component values are R = 8.2 kΩ, C = 0.01μF, R_1 = 1.2kΩ, R_F = 39k. Determine whether sustained oscillations are produced? Justify. What will be the frequency of oscillations? **5**
   (d) The power dissipation of a transistor is specified as P_D(max) 150W at T_{co} = 25°c. The Tj(max) = 200°c and ambient temperatures is 40°c, The transistor is mount on a heat sink. Calculate the maximum **5**

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permissible power dissipation of the transistor.
$\theta jc = 0.5^{\circ}c/w$, $\theta cs = 0.2^{\circ}c/w$, $\theta sa = 1.5^{\circ}c/w$.

3. (a) Compare various types of negative feedback with block diagram. **10**
   (b) Analyse the following circuit diagram to obtain the expressions for the differential voltage gain, common mode gain and differential input resistance. Hence find their values. **10**

4. (a) With neat circuit diagram, derive expressions for voltage gain for three op-amp instrumentation amplifier. Also state its features and an application. **10**
   (b) Design a class A transformer coupled power amplifier for the following requirements o/p ac power = 5w, $V_{cc} = 12v$, load resistance = 12Ω, $S_{ico} \leq 8$ Calculate overall efficiency at full load. **10**

5. (a) Derive expression for maximum efficiency for class A and class B transformer coupled power amplifier. **10**
   (b) For the circuit shown in figure below, determine Avf, Rif and Rof given hie = 1k, hfe = 100, Specify f/b type. **10**

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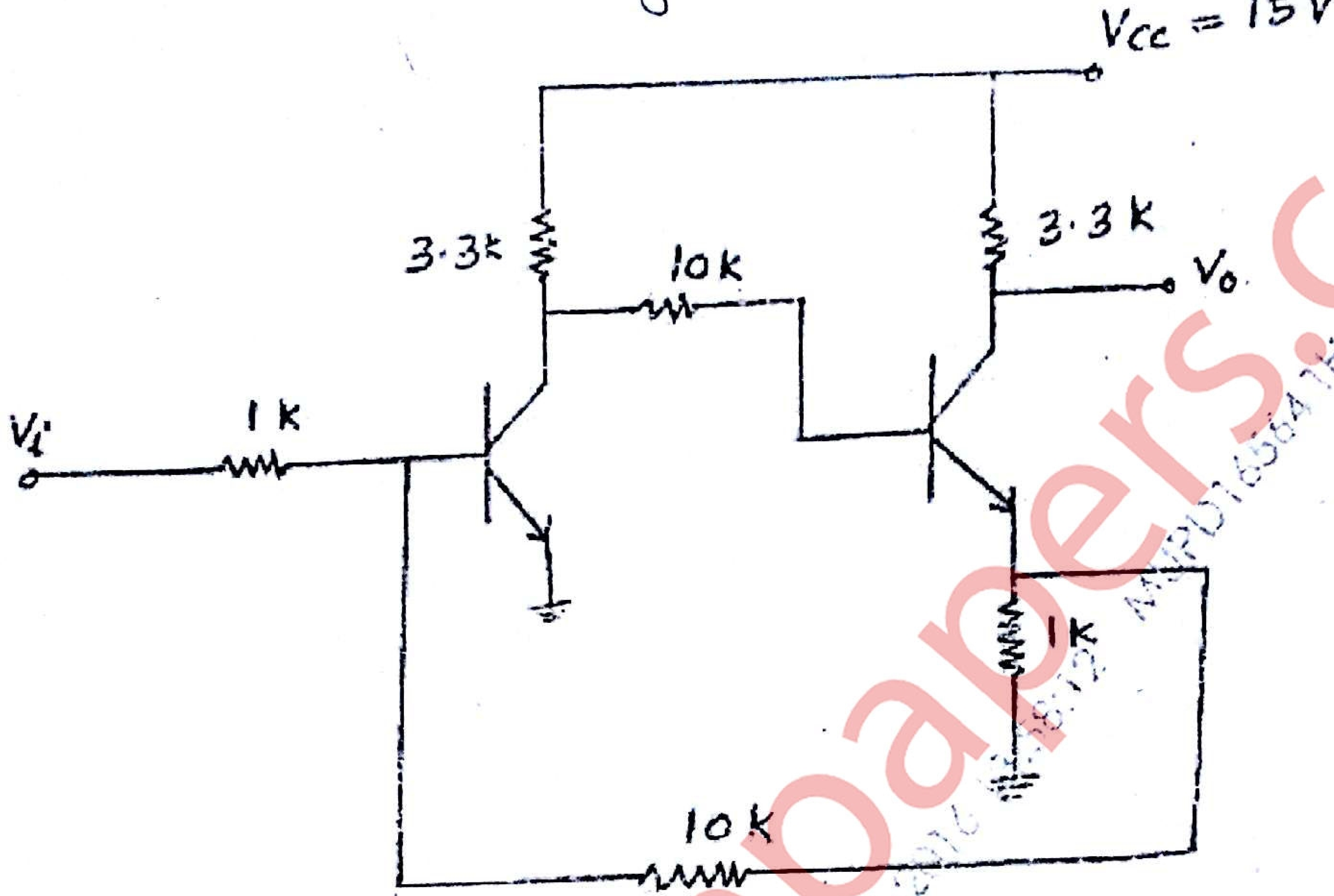

6. Write short notes on (Any Two) **20**
   (a) Nyquist stability criteria
   (b) Constant current source and current mirror circuit
   (c) Log and antilog amplifier

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Transistor type	$P_{D\,max}$ @ 25°C Watts	$I_{C\,max}$ @ 25°C Amps	V_{CE} sus volts d.c.	V_{CEO} volts d.c.	V_{CEO} (Sust) volts d.c.	V_{CER} (Sust) volts d.c.	V_{EBO} volts d.c.	V_{EBR} 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_{jc} °C/W	Derate above 25°C W/°C
2N 3055	115·5	15·0	3·1	100	60	70	90	7	200	20	50	70	15	50	120	1·8	1·5	0·7
ECN 055	50·0	5·0	1·5	60	50	55	60	5	200	25	50	100	25	35	125	1·5	3·5	0·4
ECN 149	30·0	4·0	1·5	50	40	—	—	5	150	20	50	110	35	60	115	1·2	4·0	0·3
ECN 100	5·0	0·7	0·5	25	60	65	—	6	200	50	90	280	50	90	200	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	25	—	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}	ϕ_{fe}
BC 147A	2·7 K Ω	18μ Ω	$1·5 \times 10^{-4}$	0·4°C/mw
2N 525 (PNP)	1·4 K Ω	25μ Ω	$3·2 \times 10^{-4}$	—
BC 147B	4·5 K Ω	30μ Ω	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	1·4	2·0	2·4	2·5	3·0	3·5	4·0
Ids max. mA	10	9·0	8·0	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	8·2	6·8	5·8	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_{gs} max. Volts	V_{gg} max. Volts	P_d max. @25°C	T_j max.	I_{dss}	g_{os} (typical)	$-V_p$ Volts	r_d	Derate above 25°C	g_{fs}
2N5822	50	50	50	300 mW	175°C	2 mA	3000 μ Ω	6	50 KΩ	2 mW/°C	0·59°C/mW
BFW 11 (typical)	30	25	30	300 mW	200°C	7 mA	5000 μ Ω	2·5	50 KΩ	—	0·59° C/mW