

Electronic Circuits & Design - I

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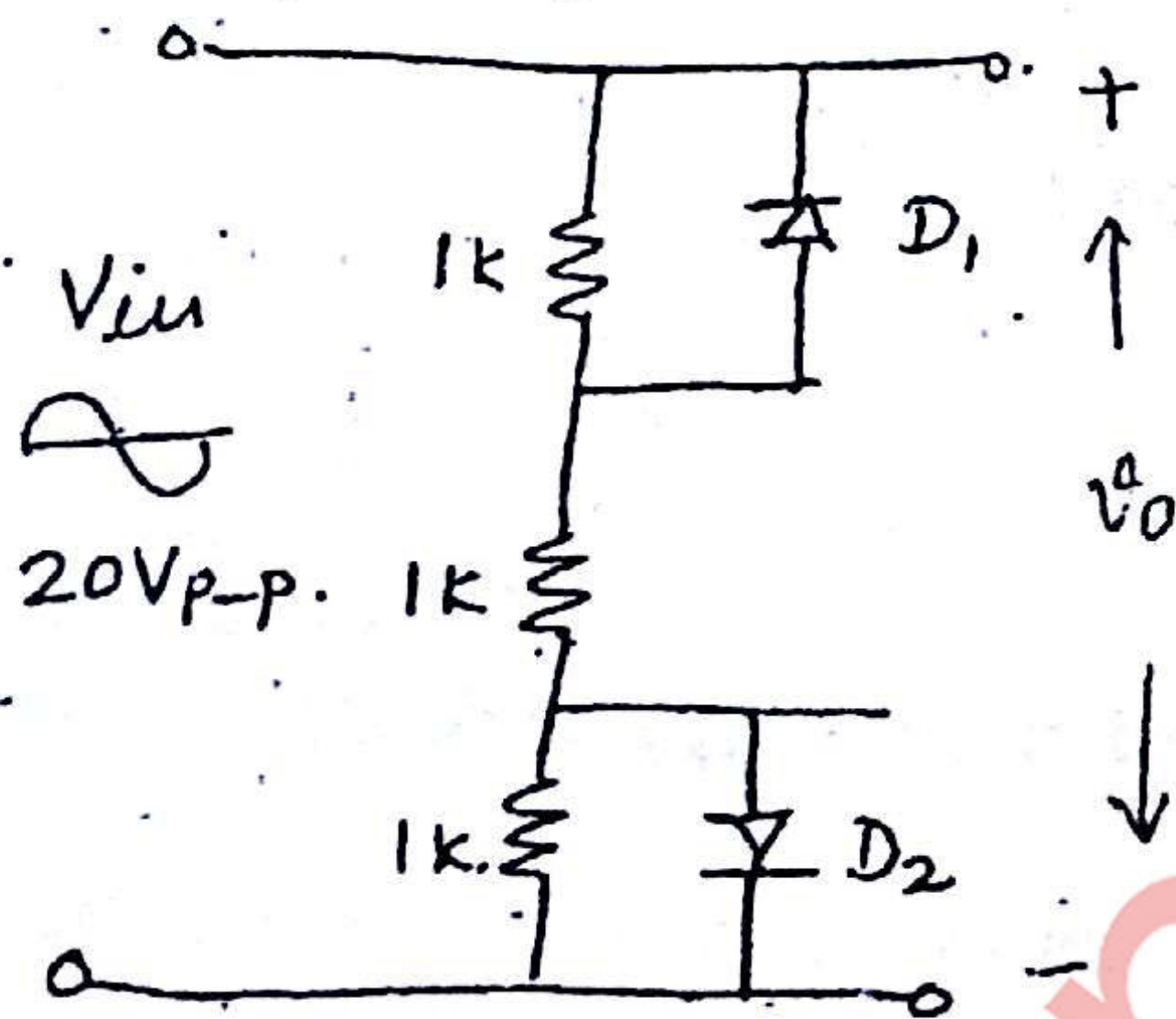
SE/III/BM/CBGS/ECAD-I
QP Code : 5217

(3 Hours)

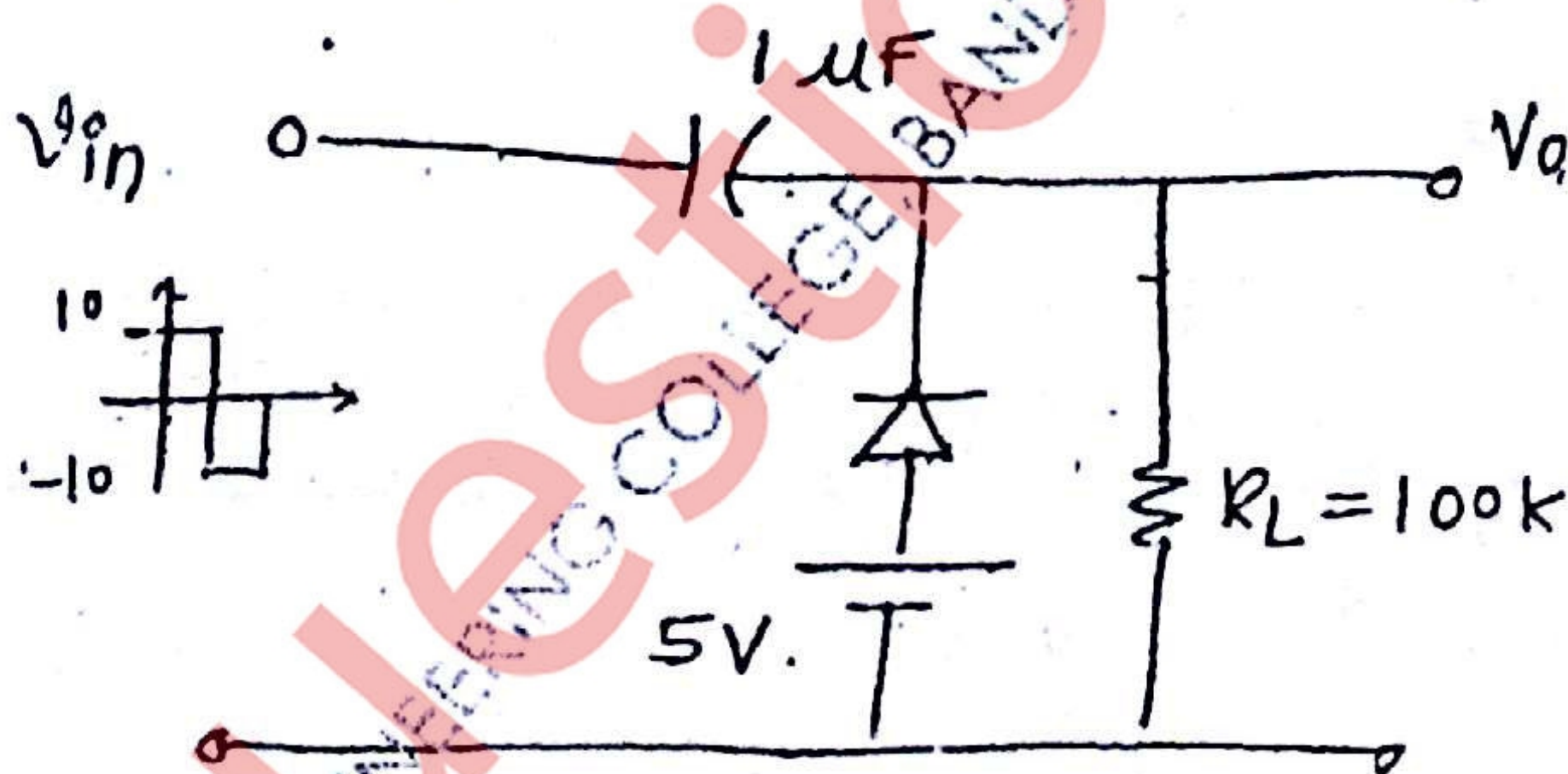
[Total Marks : 80

- N. B. : (1) Question No. 1 is compulsory.
(2) Attempt any three out of remaining five questions.
(3) Assume suitable values if required.

1. (a) With neat sketches explain input-output characteristics of BJT in CE configuration. 5
(b) Explain zero temperature drift of JFET. 5
(c) Draw output voltage waveform for the given circuit. 5



- (d) Determine output voltage V_o for the circuit shown. 5

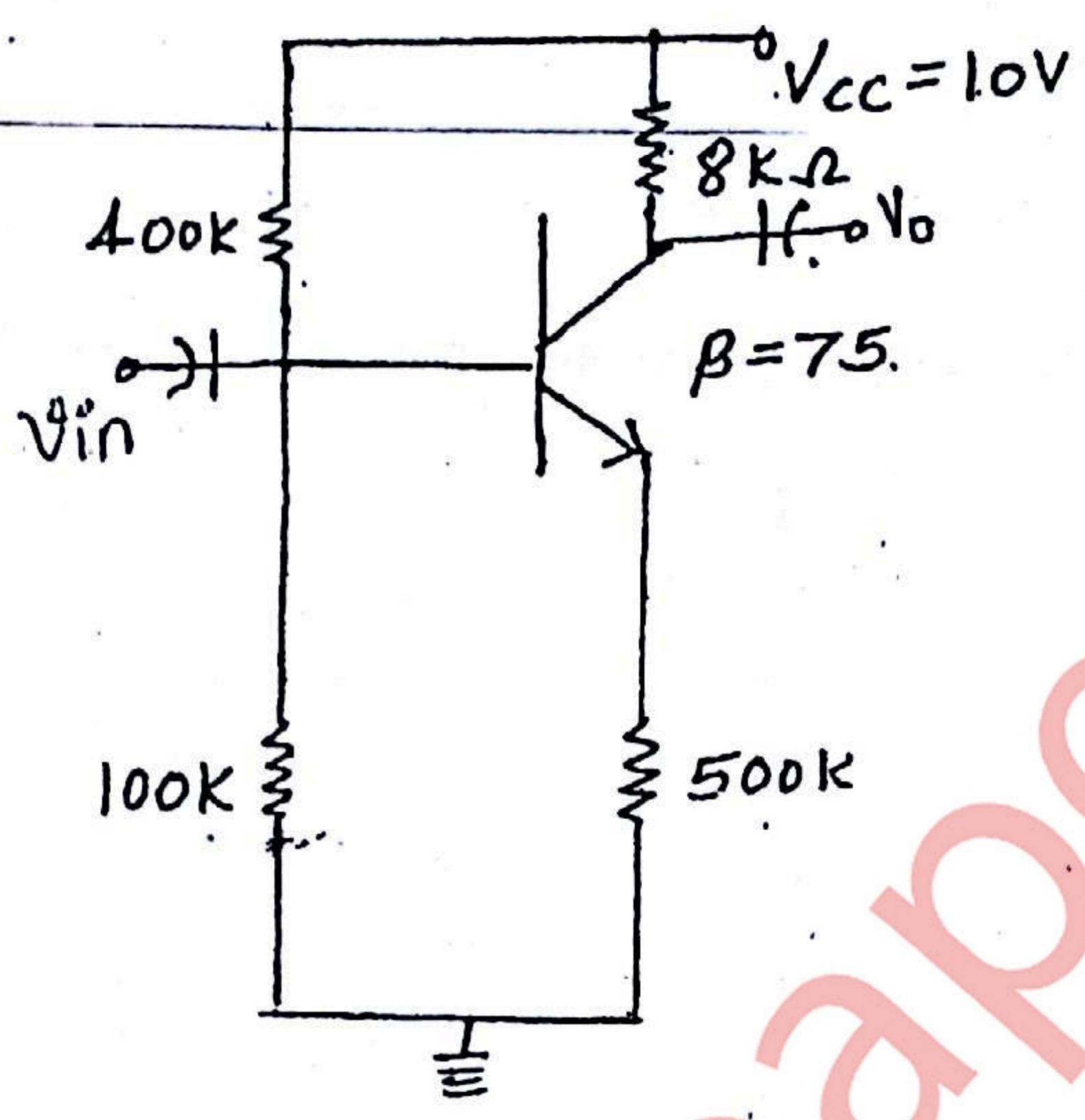


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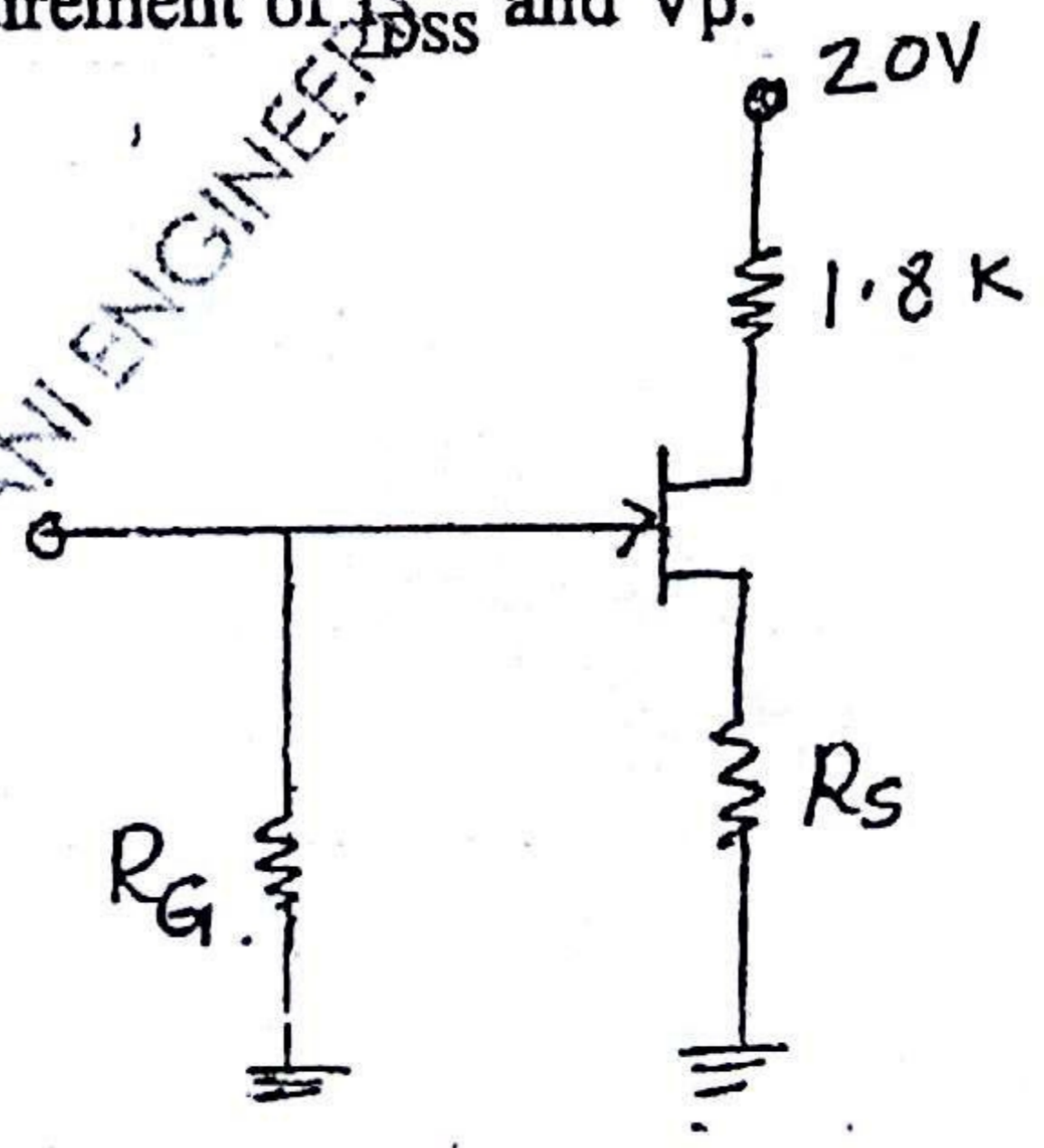


2. (a) An amplifier circuit is shown in the figure. Determine the co-ordinates of the operating point Q the stability factor S_{ICO} & A_v . 10



- (b) Differentiate enhancement and depletion type MOSFET. 10
3. (a) Design a single stage CS amplifier for audio frequency range with $|A_v| = 10$, $R_i \geq 1 M$, using JFET BFW11 for zero temp drift. Also calculate gain for the designed circuit. 10
- (b) Explain five parameters of JFET. 10
4. (a) Derive relations of A_v , Z_{in} , Z_o of CG configuration of JFET. 10
- (b) Design self bias circuit to meet the following specifications. 10

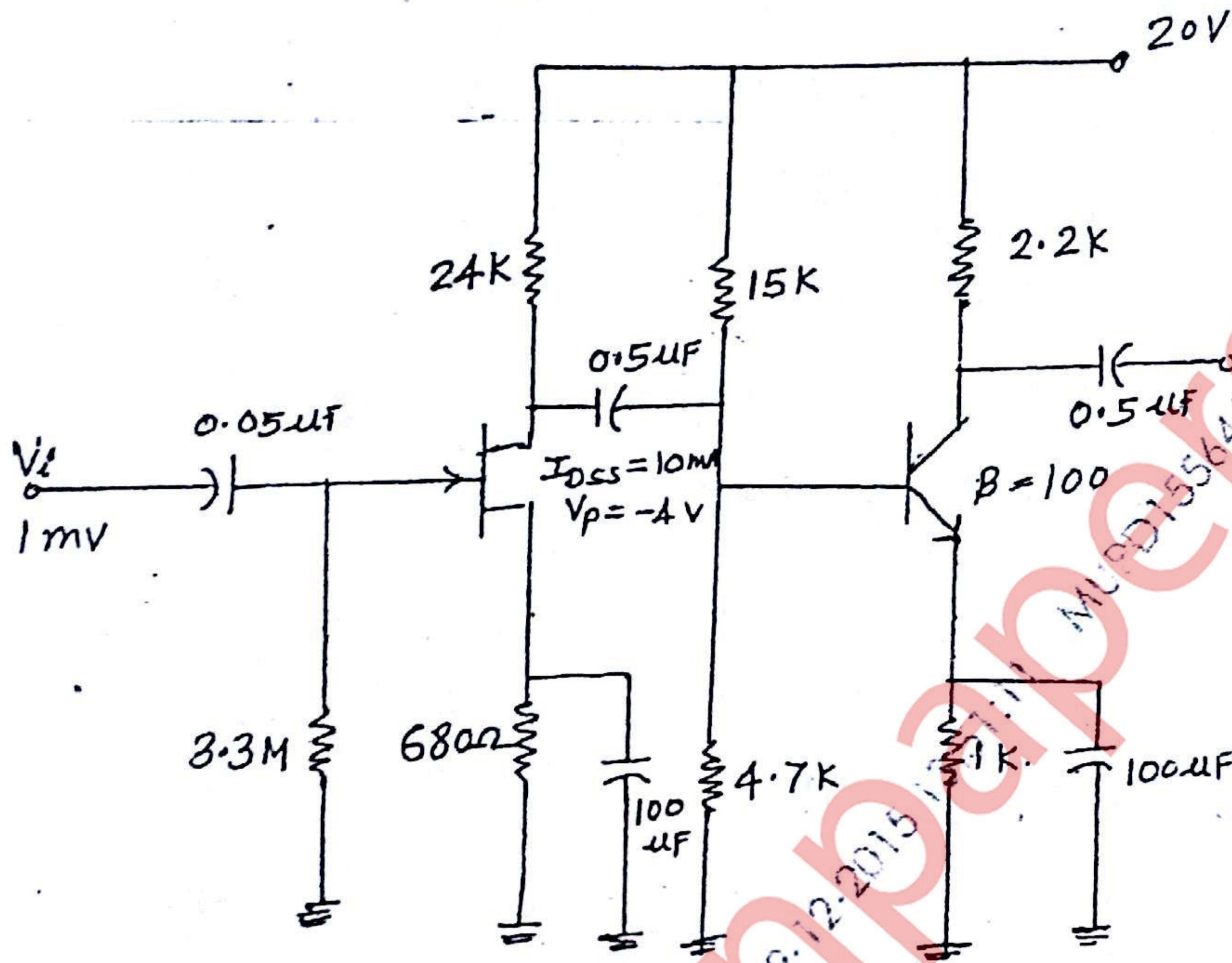
$V_{DD} = 20V$, $V_D = 12V$, $V_{GSQ} = -2V$, $R_D = 1.8k$. Comment on the requirement of I_{DSS} and V_p .



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5. Calculate Z_{in} , Z_o , A_v , V_o , f_L

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6. Write short notes on (any two) :-

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- (a) Hybrid- π equivalent model
- (b) Cascode amplifier. (Include ac-dc analysis)
- (c) Biasing circuit used for BJT

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DATA SHEET

Transistor type	P _{dm} max @ 25°C Watts	I _{cm} max @ 25°C Amps	V _{ceo} (SUS) volts d.c.	V _{ces} (SUS) volts d.c.	V _{ces} (SUS) volts d.c.	V _{ces} (SUS) volts d.c.	V _{res} volts d.c.	T _j max °C	D.C. current		Small Signal		h _{FE} max.	V _{ce} max.	θ _{JA} °C/W	Derate above 25°C W/°C
									min	typ	max.	min.				
2N 3055	115.5	15.0	100	70	90	7	200	20	50	70	15	50	120	1.8	1.5	0.7
ECN 055	50.0	5.0	60	55	60	5	200	25	50	100	25	75	125	1.5	3.5	0.4
ECN 149	30.0	4.0	50	—	—	8	150	30	50	110	33	60	115	1.2	4.0	0.3
ECN 100	5.0	0.7	70	65	—	6	200	50	90	280	50	90	280	0.9	35	0.05
BC147A	0.25	0.1	50	45	50	6	125	115	180	220	125	220	260	0.9	—	—
2N 525(PNP)	0.225	0.5	85	30	—	—	100	35	—	65	—	45	—	—	—	—
BC147B	0.25	0.1	50	45	50	6	125	200	290	450	240	330	500	0.9	—	—

BFW 11 JFET MUTUAL CHARACTERISTICS

-V _{GS} volts	I _{DS} max. mA	I _{DS} typ. mA	I _{DS} min. mA	g _m (typical) μS	r _{ds} -V _{GS} Volts		θ _{JA}
					min.	max.	
0.0	0.2	0.0	0.0	0.6	0.8	1.0	3.5
1.0	9.0	7.6	6.8	7.6	6.1	4.2	4.0
5.0	5.4	4.6	4.0	4.6	3.3	1.7	0.0
10.0	2.2	1.6	1.0	1.6	0.5	0.0	0.0

N-Channel JFET

Type	V _{DS} max. Volts	V _{GS} max. Volts	P _D max. @ 25°C mW	T _j max. °C	I _{DS} (typical) μA	r _{ds} -V _{GS} Volts	Derate above 25°C
2N3822	50	50	300	175	3000	50 KΩ	2 mW/°C
BFW 11 (typical)	30	30	300	200	5600	50 KΩ	0.59° C/mW

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