St- Sem - IV (Biomed.)

Sem. IV (Biomed) CBGS

29/5/14

ECD - II

Electronic Circuit Analysis & Design - II

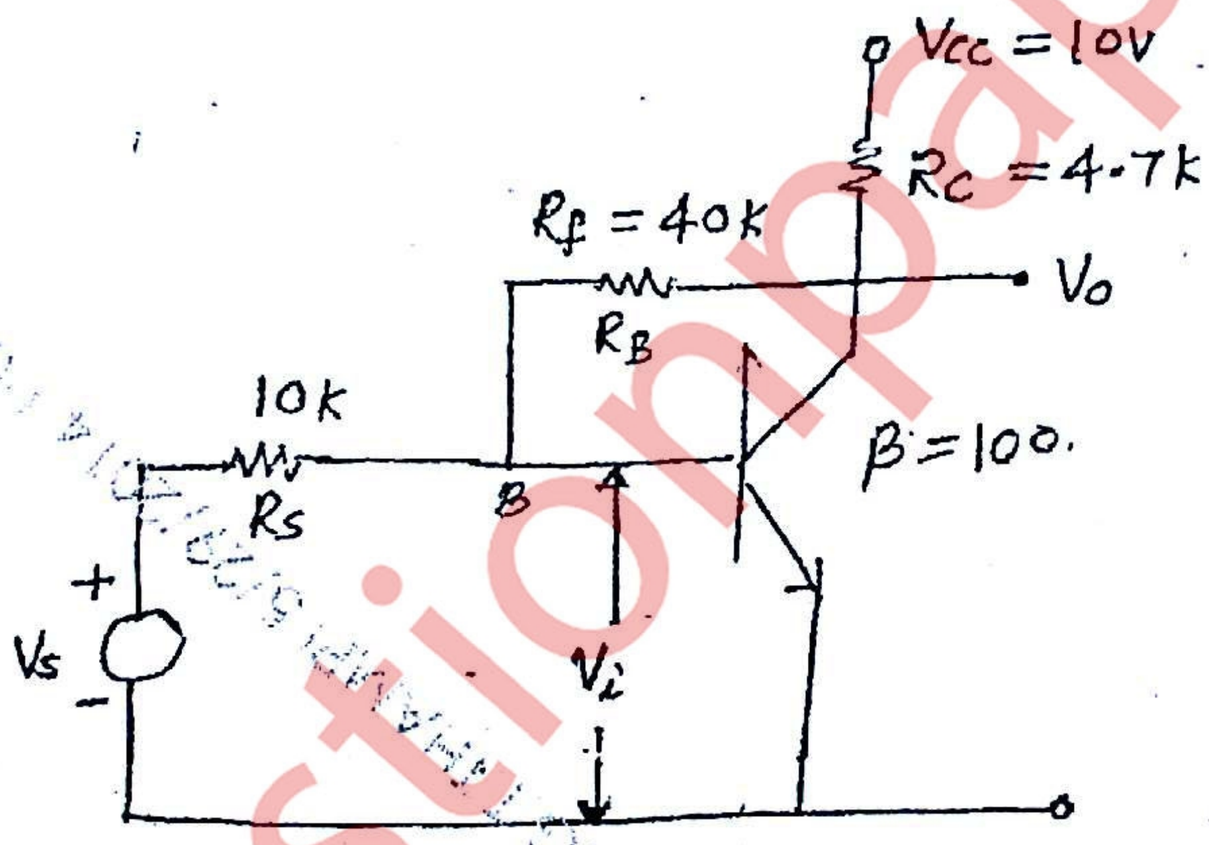
QP Code :NP-19767

(3 Hours) (20) **[Total Marks : 80**

N.B. : (1) Question No. 1 is **compulsory.**
(2) Answer any **three** questions from remaining **five** questions.
(3) Assume **suitable** data if **necessary.**

1. (a) Explain any two electrical characteristics of op-amp. Give its ideal and practical values. **5**
   (b) Explain the advantages and limitations of use of swamping resistor in differential amplifier. **5**
   (c) Distinguish Class B and Class C power amplifier. **5**
   (d) Explain zero crossing detector. **5**

2. (a) Compare various types of negetive feedback. (Block diagram compulsory). **10**
   (b) For the circuit shown in figure identify the feedback topology. Using negative feedback approach, determine A_{vf}, R_{if} and R_{of}. **10**



3. (a) Derive expressions for input resistance, output resistance and voltage gain, CMRR for single input balanced output differential amplifier. **10**
   (b) For the following given specifications for the dual input balanced output differential amplifer, **10**

$R_c = 2{\cdot}2$ K, $R_1 = 4{\cdot}7$ K, $Rin_1 = Rin_2 = 50\ \Omega$,

$R_E = 1$ K, $V_{CC} = 20$ V, $V_{EE} = -20$ V,

$\beta_{dc} = \beta_{ac} = 100$, $V_{BE} = 0{\cdot}7$ V.

Determine the quiescent collector current, collector to emitter voltage VCEQ. Also calculate Ad, Ac, CMRR, Rin and Ro.

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4. (a) Derive expressions for maximum efficiency of transformer coupled class A amplifies and also for class B amplifier. 10

(b) Design class A transformer coupled amplifier to provide 12 W power to the speaker of 10 Ω. 10

5. (a) Derive a relation for frequency of oscillations and condition for sustained oscillations of wein Bridge Oscillator. 10

(b) Design following circuits using op-amp :– 10

(i) A sine wave of 1 Khz frequency.

(ii) $V_0 = -\int Vin \cdot dt$

6. Explain following applications of op-amp (any **two**) :– 20

(a) Temperature compensated log amplifier.

(b) Instrumentation amplifier.

(c) Precision rectifier.

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DBEC DATA SHEET

Transistor type	Pdmax @ 25°C Watts	Icmax @ 25°C Amps	V_{ce} (sat) volts d.c.	V_{ceo} volts d.c.	V_{ceo} (Sus) volts d.c.	V_{cex} (Sus) volts d.c.	V_{cex} volts d.c.	V_{eco} volts d.c.	T_j max °C	D.C. current gain min	typ.	max.	Small Signal h_{fe} min.	typ.	max.	V_{be} max.
2N3055	115·5	15·0	1·1	100	60	70	90	7	200	20	50	70	15	50	120	1·8
ECN055	50·0	5·0	1·0	60	50	55	60	5	200	25	50	100	25	75	125	1·5
ECN149	30·0	4·0	1·0	50	40	—	—	8	150	30	50	110	33	60	115	1·2
ECN100	5·0	0·7	0·6	70	60	65	—	6	200	50	90	280	50	90	280	0·9
BC147A	0·25	0·1	0·25	50	45	50	—	6	125	115	180	220	125	220	260	0·9
2N525(PNP)	0·225	0·5	0·25	85	30	—	—	—	100	35	--	65	—	45	—	—
BC147B	0·25	0·1	0·25	50	45	50	—	6	125	200	290	450	240	330	500	0·9

Transistor type	hie	hoe	hre	oja
BC 147A	2·7 K Ω	18μ ℧	$1·5 \times 10^{-4}$	0·4°C/mw
2N 525 (PNP)	1·4 K Ω	25μ ℧	$3·2 \times 10^{-4}$	—
BC 147B	4·5 K Ω	30μ ℧	2×10^{-4}	0·4°C/mw

BFW 11—JFET MUTUAL CHARACTERISTICS

-Vas 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
Ios 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
Ios 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
Ios 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

N-Channel *JFET*

Type	V_{ds} max. Volts	V_{gg} max. Volts	V_{os} max. Volts	P_d max. @25°C	T_j max.	I_{dss}	g_{os}	$-V_p$ Volts	r_d	Derate above 25°C
2N3822	50	50	50	300 mW	175°C	2 mA	3000 μΩ	6	50 KΩ	2 mW/°C
BFW 11 (typical)	30	30	30	300 mW	200°C	7 mA	5000 μΩ	2·5	50 KΩ	—

UJT type	P_d max. @25°C	I_E max. @25°C	I_p peak pulse current max.	V_{eix} Volts max.	V_{eb1} Volts	T_j max	η min.	η max.	R_{bb} KΩ min.	R_{bb} KΩ typ.	R_{bb} KΩ Max.	I_v max.	I_v μA
2N2646	300mW	50mA	2Amp.	30	35	125°C	0·56	0·75	4·7	7·0	9·1		5·0