S.E (EXTC) Sem III (R) 15-5-09

Electronic Devices & Circuits-I 3-6 P

Con. 2661-09. VR-3357

(REVISED COURSE)

(3 Hours) [Total Marks : 100

N.B.: (1) Question Nos. **1** and **4** are **compulsory**.
(2) Attempt any **three** from remaining.
(3) Assume **suitable** additional data whenever **necessary**.
(4) Use of **Data Sheet** given in **Last Page**.

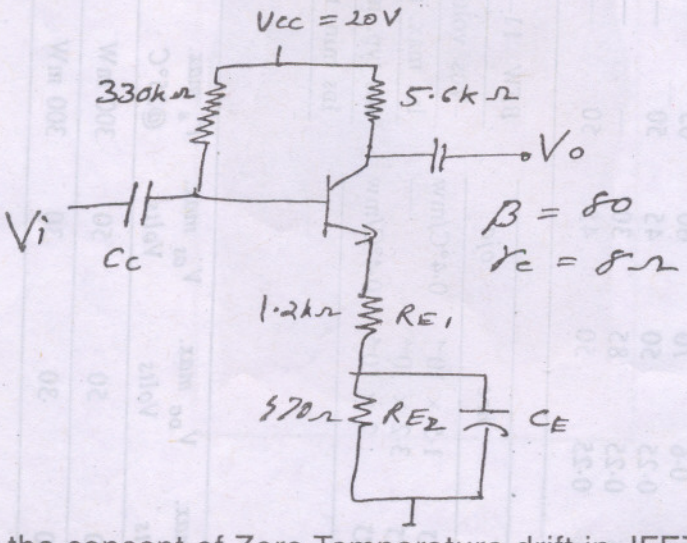
1. Design a small signal CE amplifier to meet the following specifications : **20**
   $V_0 = 3{\cdot}5$ V(peak)
   $I_0 = 2{\cdot}47$ mA
   $|Av| \geq 35$
   $S \leq 10$
   Lower cutoff frequency = 20 Hz.
   Find Av Zi Z0 for designed Transistor.

2. (a) Compare series and shunt regulator circuits using BJT. **10**
   (b) Explain various baising methods of JFET and compare them for their stability. **10**

3. (a) Design full wave rectifier to supply load current of 100 mA $\pm$ 25 mA at 250 V with ripple voltage less than 10 V **15**
   Use LC filter.
   (b) Draw and Explain UJT as relaxation oscillator also give the frequency of oscillation. **5**

4. Design a single stage CS Amplifier using JFET with baising circuit to provide stability of operating point against device variation so that 2·2 mA $\leq$ IOS $\leq$ 4·4 mA and $|Av| = 10$. **20**
   From the designed amplifier determine what will be the maximum output voltage that can be obtained without distortion and corresponding input voltage and input resistance.

5. (a) Find Zo Zi Av Ai for the network given **15**



   (b) Explain the concept of Zero Temperature drift in JFET. **5**

6. (a) For a shunt Zener regulator, giving output voltage is 10 V and load resistance varying from 5kΩ to 10 kΩ. V_{in} is varying between 18 to 22V. Find : 10

(i) R series resistance

(ii) P_2 (max)

(iii) S_V

(iv) R_o

Take $R_2 = 4\ \Omega$ $I_{2(min)} = 50\ \mu A$.

(b) Explain the concept of Thermal runway in BJT. 5

(c) Explain Latching current and holding current in SCR. 5

[TURN OVER

DBEC DATA SHEET

Transistor type	Pdmax @ 25°C Watts	Icmax @ 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_{fe} °C/W
2N3055	115·5	15·0	1·1	100	60	70	90	7	200	20	50	70	15	50	120	1·8	1·5
ECN055	50·0	5·0	1·0	60	50	55	60	5	200	25	50	100	25	75	125	1·5	3·5
ECN149	30·0	4·0	1·0	50	40	—	—	8	150	30	50	110	33	60	115	1·2	4·0
ECN100	5·0	0·7	0·6	70	60	65	—	6	200	50	90	280	50	90	280	0·9	35
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

–VGS 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	
IDS 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	
IDS 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	
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	

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_{mo}	$-V_P$ 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	0·5
BFW 11 (typical)	30	30	30	300 mW	200°C	7 mA	5000 μΩ	2·5	50 KΩ	——	0·59

UJT type	P_d max. @25°C	I_E max. @25°C	I_P peak pulse current max.	V_{B2E} Volts max.	V_{B2B1} Volts	T_j max	η min.	η max.	R_{BB}KΩ min.	R_{BB}KΩ typ.	Max.	I_P max. μA	I_V min.	I_V m
2N2646	300mW	50mA	2Amp.	30	35	125°C	0·56	0·75	4·7	7·0	9·1	5·0		4