S.E. Sem 3 (Rev.) Electronics Devices & Circuits I. 04/12/08

Con. 5452-08. EXTC **RC-8774**

(REVISED COURSE)

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

N.B. : (1) Question Nos. **1** and **2** are **compulsory.**

(2) Solve any **three** questions from **remaining.**

(3) Assume **suitable additional data** wherever **necessary.**

1. Design single stage R-C coupled CE amplifier using BJT to meet the following specifications. $|A_v| \geq 150$. $S_{ICO} \leq 10$. $F_L = 20$ Hz. $V_o = 5$ V RMS $V_{CC} = 18$ V $h_{ie} = 2.7$ K $h_{fe} = 220$ h_{oe}, h_{re} may be neglected. Calculate A_v, R_i, R_o of the amplifier you have designed. **20**

2. (a) Design an R_c coupled CS amplifier using FET BW -11 to meet the following specification. $|A_v| \geq 15$ $I_{DSQ} = 1.2$ mA $F_L \leq 20$ Hz. $V_o = 2.5$ V $R_i \geq 1$ M ohm. **15**

(b) A certain JFET has $I_{DSS} = 15$ mA and pinch off voltage $V_p = -5$ V. Calculate value of transconductance for $V_{GS} = -2$ V. **5**

3. (a) For full wave rectifier with center tapped transformer (20-0-20 rms, 50 Hz), $R_l = 10\ \Omega$. **15**

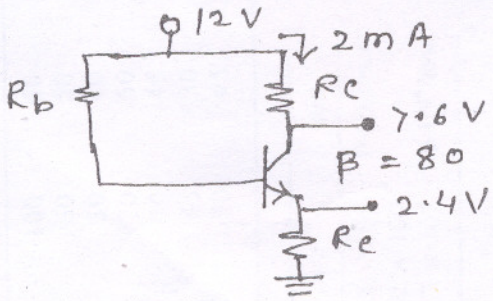
(i) Find V_{dc}, I_{dc} and ripple factor

(ii) Repeat part 1 if 10.000 μF is considered and is shunted across the load

(iii) Repeat part 1 if 100 m h inductor is present in series with load.

(b) Draw UJT equivalent circuit and explain UJT characteristic curve. **5**

4. (a) Determine R_c, R_e, R_b, V_{ce} and V_b. 10



(b) (i) Show that in self bias circuit, the drift of quiescent point due to temperature changes is made up automatically. 10

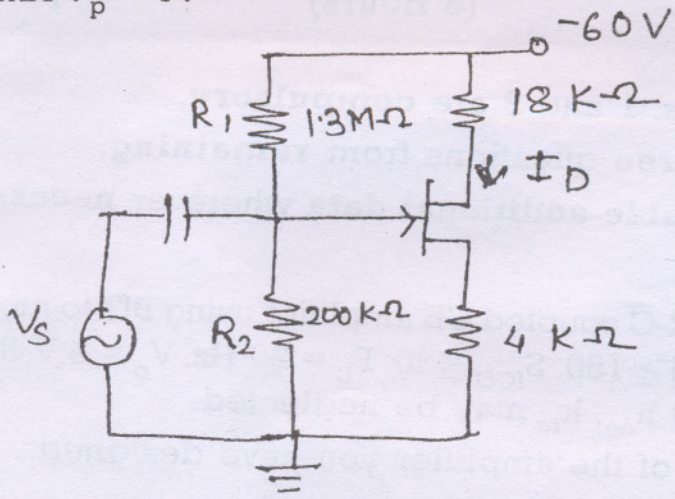
(ii) Compare Triac with Diac.

5. (a) Explain various methods of biasing JFET and MOSFET. 15

(b) Draw and explain series regulator circuit using BJT. 5

6. (a) Find the quiescent values of V_{ds}, I_d and V_{gs} for the amplifier shown. **10**

$I_{dss} = -4$ mA $V_p = 4$V



(b) (i) Explain line regulation and ripple rejection for regulated power supply. **10**

(ii) A particular optocoupler has current transfer ratio of 30 percent. If input current is 100 mA, What is cutput current ?

7. (a) Describe four ways an SCS can be turned off. **20**

(b) Compare methods of biasing BJT.

(c) What is critical inductance ? What is L section filter ?

(d) Explain D-MOSFET Amplifier operation.

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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_{fc} °C/W	Derate above 25°C W/°C
2N3055	115·5	15·0	1·1	100	60	70	90	7	200	20	50	70	15	50	120	1·8	1·5	0·7
ECN055	50·0	5·0	1·0	60	50	55	60	5	200	25	50	100	25	75	125	1·5	3·5	0·4
ECN149	30·0	4·0	1·0	50	40	—	—	8	150	30	50	110	33	60	115	1·2	4·0	0·3
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	4·0
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	0·0
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	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_{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	θ_{ja}
2N3822	50	50	50	300 mW	175°C	2 mA	3000 μΩ	6	50 KΩ	2 mW/°C	0·59°C/mW
BFW 11 (typical)	30	30	30	300 mW	200°C	7 mA	5000 μΩ	2·5	50 KΩ	——	0·59° C/mW

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.	I_P Max.	I_P max. μA	I_V min. mA	I_{EO} μA
2N2646	300mW	50mA	2Amp.	30	35	125°C	0·56	0·75	4·7	7·0	9·1	5·0	4·0	–2·