

(OLD COURSE) Q.P. Code : 4679

(3 Hours)

[Total Marks : 100

- N.B.:** (1) Question Nos. 1 is compulsory.
 (2) Attempt **any four** questions from the remaining **six** questions.
 (3) Figures to the **right** indicate **full** marks.
 (4) Assume suitable data whenever necessary but justify the same.

1. Design a single stage CE amplifier suitable for low frequencies upto 10Hz, to give a voltage gain $|AV| \geq 80$ and output voltage of 4.5V employing transistor BC147A. Calculate the expected $|AV|$ and maximum output voltage that can be obtained from circuit. Also calculate input resistance of the circuit specify clearly the supply voltage V_{cc} . Select stability factor $S \leq 10$. 20

2. (a) Design a single stage common source amplifier for audio frequency applications suitable for operation upto low frequency of 20Hz. Use JFET type BFW-11 to give output voltage of 2V. and voltage gain $|AV| = 10$. For design use mutual characteristics of $V_{GS} - I_{DS}(\text{typ})$ given in data sheet. 15

$$\text{Design for } I_D = \frac{I_{DSS}}{2}$$

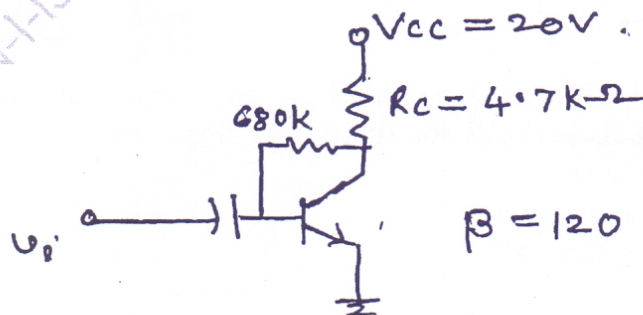
(b) Calculate 5
 (i) input impedance
 (ii) output impedance
 (iii) voltage gain for the designed circuit.

3. (a) Explain the operation of transistor series regulator with one transistor, derive expression for line & load regulation for the same. 10

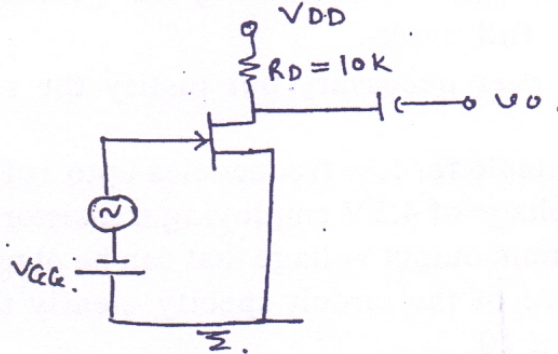
(b) Draw output characteristics of common emitter configuration. Show how transistor amplifies a time varying signal by drawing a DC load line on the characteristics. 10

4. (a) For the circuit shown in figure Determine following. 10

- (i) I_C
 (ii) V_{CE}
 (iii) V_B
 (iv) V_C

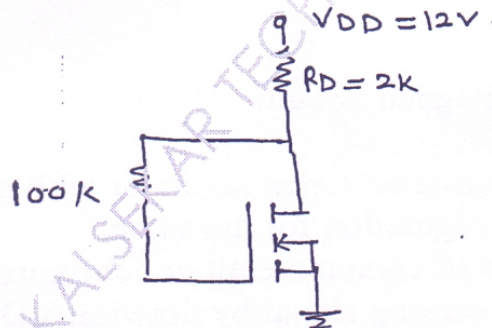


- (b) Calculate the voltage gain and output resistance of the following circuit. Given 10
that $g_m = 2\text{mA/v}$ & $r_d = 50\text{k}$.



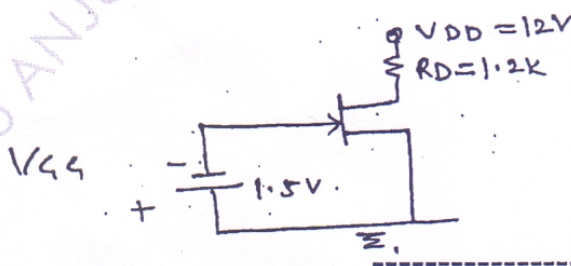
5. (a) Draw circuit diagram for half wave rectifier with capacitor filter with load resistor R_L . 10
Explain the working by drawing appropriate waveforms derive the expression for the ripple factor 'r'. 10
(b) The following parameters are obtained from certain JFET data sheet
 $V_{GS\ off} = -8\text{V}$ & $I_{DSS} = 6\text{mA}$. Determine the values of I_D for each value of V_{GS} ranging from 0V to -8V in 1V steps, plot the transfer characteristics for same data.

6. (a) $I_D\ (ON) = 6\text{mA}$
 $V_{GS}\ (ON) = 8\text{V}$
 $V_{GS}\ (Th) = 3\text{V}$
Determine
(i) I_{DQ}
(ii) V_{DSQ}



- (b) Explain any two 10
(i) UJT construction, characteristics & parameters.
(ii) SCR working & applications.
(iii) BJT as a switch
(iv) Power MOSFET

7. (a) Explain the working of UJT relaxation oscillator and draw waveform. 10
(b) Determine drain current I_D & V_{DS} for fixed bias JFET circuit. 10



$I_{DSS} = 12\text{mA}$
 $V_p = -4\text{V}$

Transistor type	P_{Dmax} 25°C Watts	I_{Cmax} 25°C Amps.	V_{E-Base} Volts d.c.	V_{CBO} Volts d.c.	V_{CBO} Volts d.c.	$V_{CE(sat)}$ Volts d.c.	$V_{CE(sat)}$ Volts d.c.	$V_{CE(sat)}$ Volts d.c.	$V_{CE(sat)}$ Volts d.c.	T_j max. °C	D.C. current min	current typ.	gain max	Small signal min.	Signal typ.	h_{FE} max.	V_{CE} max.	P_{Dmax} max.	θ_{JA} °C/W	Derate above 25°C W/°C
2N 3055	115.5	15.0	1.1	100	60	60	70	90	7	200	20	50	70	15	50	120	1.8	1.5	0.7	
ECN 055	50.0	5.0	1.0	60	50	55	60	5	200	25	50	100	25	25	75	125	1.5	3.5	0.4	
ECN 149	30.0	4.0	1.0	50	40	-	-	8	150	30	50	110	33	60	115	1.2	4.0	0.3	0.05	
ECN 100	5.0	0.7	0.6	70	60	65	65	6	200	50	90	280	50	90	280	0.9	0.9	-	-	
BC 147A	0.25	0.1	0.25	50	45	50	50	8	125	115	180	220	125	220	260	0.9	0.9	-	-	
2N 525 (PNP)	0.225	0.5	0.25	85	30	-	-	-	100	35	-	65	-	45	-	-	-	-	-	
BC 147 B	0.25	0.1	0.25	50	45	50	50	5	125	200	290	450	240	330	500	0.9	0.9	-	-	

Transistor type	h_{FE}	h_{FE}	h_{FE}	β_{DC}
BC 147 A	2.7KΩ	18μmho	15×10^{-4}	0.4 C/mW
2N 525 (PNP)	1.4KΩ	25μmho	32×10^{-4}	-
BC 147B	4.5KΩ	30μmho	2×10^{-4}	0.4 C/mW
ECN 100	50Ω	-	-	-
ECN 149	15Ω	-	-	-
ECN 055	12Ω	-	-	-
2N 3055	6Ω	-	-	-

BFV 11-JFET MUTUAL CHARACTERISTICS

$-V_{GS}$ Volts	I_{DS} max. mA	I_{DS} typ. mA	I_{DS} min. mA	0.0	0.2	0.4	0.8	1.0	1.2	1.6	2.0	2.4	2.5	3.0	3.5	4.0
0.0	10	7.0	4.0	0.2	0.4	0.8	1.0	1.2	1.6	2.0	2.4	2.5	3.0	3.5	4.0	
9.0	8.3	6.0	3.0	0.3	0.6	1.0	1.2	1.6	2.0	2.4	2.5	3.0	3.5	4.0		
6.1	5.4	4.0	0.5	0.6	1.0	1.2	1.6	2.0	2.4	2.5	3.0	3.5	4.0			
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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_{DS} max. Volts	P_{Dmax} @ 25°C	T_j max. °C	I_{DS} max. mA	$R_{DS(on)}$ (typical) mho	$-V_{GS}$ Volts	f_t	Drain $A_{V(f=1\text{kHz})}$ at 25°C	θ_{JA}
2N3622	50	50	50	300 mW	175°C	2 mA	3000 μ mho	6	50 KΩ	2 mV/μV	0.69°C/mW
BFV 11 (typical)	30	30	30	300 mW	200°C	7 mA	5000 μ mho	25	50 KΩ	-	0.37°C/mW