SE/ETRX/IV CR.) 21/5/13

ECAD

AGJ 1st half (d+) 45

Con. 6549-13. **GS–7101**

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

N.B. : (1) Question No. **1** is **compulsory**.

(2) Attempt any **four** questions from Question Nos. **2** to 7.

(3) Assume **suitable** data wherever **necessary** with proper **justification**.

(4) **Figures** to the **right** indicate **full** marks.

1. Attempt any **four** of the following :– **20**

   (a) Differentiate between direct coupled amplifier and R–C coupled amplifier.

   (b) Differentiate between small signal amplifier and power amplifier.

   (c) Explain why constant current source is used in differential amplifier.

   (d) Give criterion of sustained sinewave oscillations and explain how oscillation starts and stabilizes in oscillator circuit.

   (e) Give important features of CASCADE amplifier.

2. Design a two stage RC coupled amplifier for following specifications :– **20**

   $A_v \simeq 1000$, $S_{I_{CO}} < 10$, $R_i > 10\ k\Omega$

   $V_{CC} = 12$ V.d.c., $f_L < 20$ Hz.

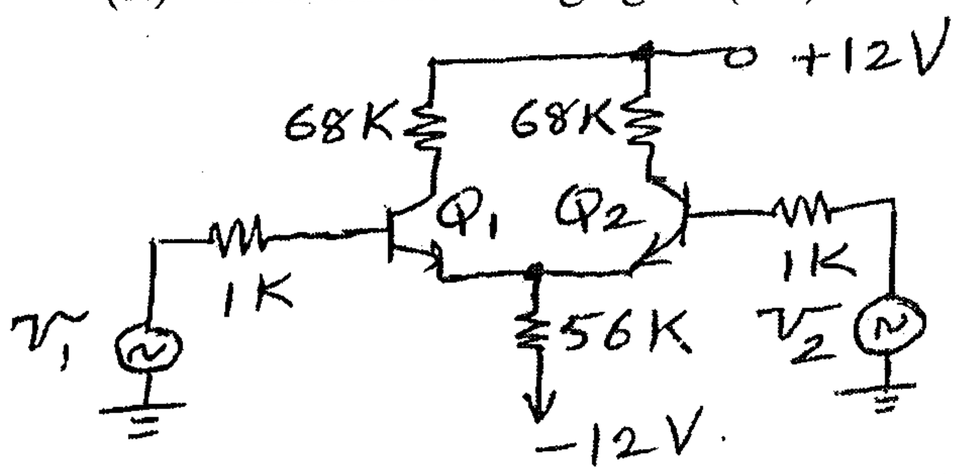
   Select transistor from the table given at the *end of question paper*.

3. (a) Explain how high frequency response of one stage RC coupled JFET CS type of amplifier can be determined. **10**

   (b) For the differential amplifier shown in **figure,** determine :–

   (i) Q-points of transistors **5**

   (ii) differential voltage gain (Ad). **5**



For transistors Q1 and Q2

$h_{ie_1} = h_{ie_2} = 2\,k\Omega$

$h_{fe_1} = h_{fe_2} = \beta_1 = \beta_2 = 100$

(neglect h_{oe} and h_{re})

4. (a) List diffferent types of negative feedbacks, give their stability ratios, effect of feedback on input resistance and on output resistance. **10**

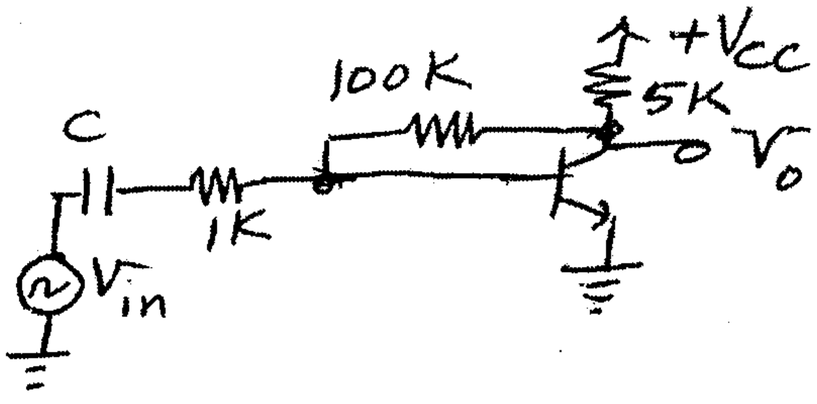
[TURN OVER

(b) For the amplifier circuit shown in **figure,** determine –

(i) Type of feedback

(ii) Stability ratio

(iii) A_{v_f} – voltage gain with feedback.



For transistor
h_{ie} = 1 k Ω
h_{fe} = 100
(Neglect h_{oe} a

5. (a) Design a class A transformer coupled power amplifier to obtain
load resistance of 10 ohm. V_{cc} = 12 V.d.c.

(b) Draw the circuit diagram of Wien Bridge oscillator and explain its

6. (a) Discuss problems encountered in multistage direct coupled amplifiers
to take care of these problems.

(b) For power dissipation of 25 Watts design a heat sink if–
$\theta_{j-c} = 1\,^{\circ}c/_{W}$, $\theta_{C-HS} = 0{\cdot}5\,^{\circ}c/_{W}$,
$T_{jmax} = 125°C$ and $T_{ambient} = 30°C$.

7. Write short notes on any **three** of the following :–

(a) Crossover distortion in class B amplifier and how to minimize the

(b) Class C amplifier and its application

(c) Nyquist stability criterion

(d) Hartley oscillator.

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_{j_a} *°C/W*	*Derate above 25°C W/°C*
2N 3055	115·5	15·0	1·1	100	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	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
ECN 100	5·0	0·7	0·6	70	60	65	—	6	200	50	90	280	50	90	280	0·9	35	0·05
BC147A	0·25	0·1	0·25	50	45	50	—	6	125	115	180	220	125	220	260	0·9	—	—
2N 525(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*	*θja*
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
ECN 100	50 Ω	—	——	——
ECN 149	15 Ω	—	——	——
ECN 055	12 Ω	—	——	——
2N 3055	6 Ω	—	——	——

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} *(typical)*	$-V_p$ *Volts*	r_d	*Derate above 25°C*	θ_{ja}
2N3822	50	50	50	300 mW	175°C	2 mA	3000 μ ℧	6	50 KΩ	2 mW/°C	0·59°C/mW
BFW 11 (typical)	30	30	30	300 mW	200°C	7 mA	5600 μ ℧	2·5	50 KΩ	——	0·59° C/mW