Con. 6200-10. Electronic Dev & Circ – II GT-6510

(3 Hours) [Total Marks : 100

S.E / EXTC - Sem-IV

N.B. (1) Question No. **1** is **compulsory**.
(2) Solve any **four** questions from the remaining.
(3) Assume **suitable** data if **necessary** and mention the **same** in answer-sheet.

Electronic Devices & Circuit - II

1. Solve any **four** :— **20**
   (a) Explain how to improve CMRR in differential amplifier.
   (b) Explain principle of operation of oscillator.
   (c) State the importance of frequency response in amplifier circuits. Why at low and at high frequencies gain of CE amplifier is low.
   (d) What are the advantages of negative feedback ?
   (e) Differentiate between Small signal and Large signal amplifiers.

2. Design a two stage RC coupled BJT amplifier to meet the following specifications :— **20**
   $A_V \geq 5000$, $S_{ICO} \leq 10$, $f_L \leq 20$ Hz, $V_O = 2.5$ V and $V_{CC} = 12$ V.
   For designed circuit calculate A_v, R_i and R_o.

3. For the circuit shown in **figure**.

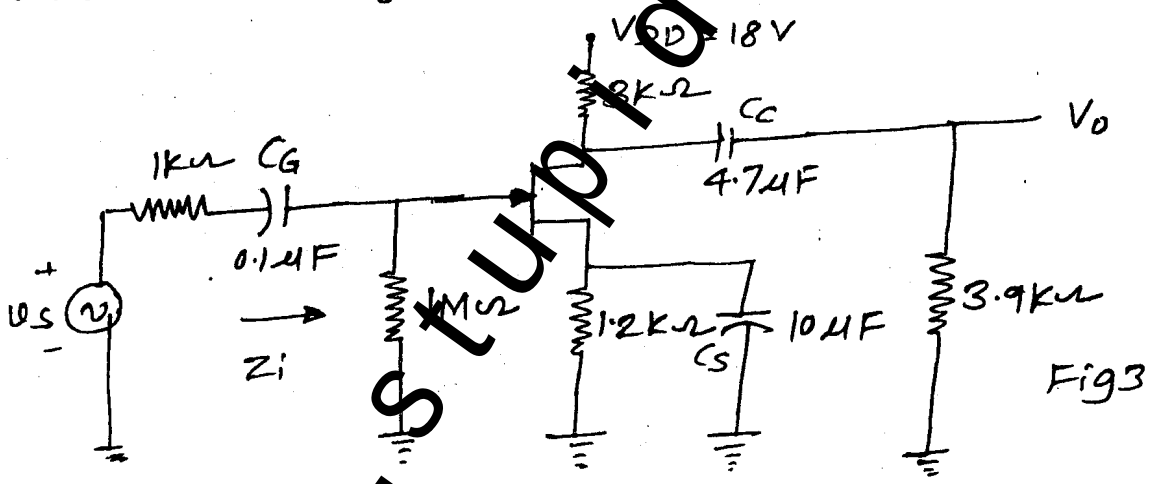

Fig3

For JFET $I_{DSS} = 6$ mA, $V_P = -6$ V, $r_d = \infty$, $C_{gd} = 4$ pF, $C_{gs} = 6$ pF, $C_{ds} = 1$ pF and $C_{wi} = 3$pF, $C_{wo} = 5$ pF.

   (a) Determine V_{GSQ} and I_{DSQ}. **4**
   (b) Determine gm_o and gm. **2**
   (c) Calculate midband gain $A_v = \frac{V_o}{V_i}$ **2**
   (d) Determine Z_i **1**
   (e) Calculate $A_{VS} = \frac{V_O}{V_S}$ **2**
   (f) Calculate lower cutoff frequency due to C_G, C_S and C_C a shown in **figure.** Also find effective lower cutoff frequency. **4**
   (g) Calculate higher cutoff frequency due to input time constant (fH_i) and due to output time constant (fH_o). **5**

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4. (a) For the circuit shown in **figure**, identify type of feedback and determine (i) Avf, (ii) Rif, (iii) R'of using feedback approach. (**Note** Vcc is not required.) **10**

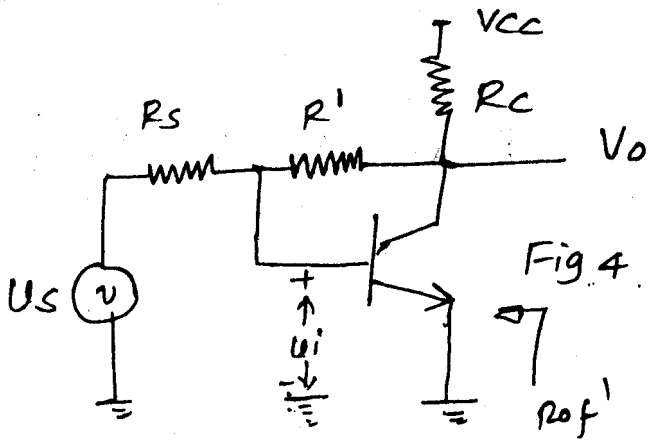

Fig 4

(b) Explain various types of negative feedback amplifiers with the help of neat block diagrams. For each type give stability ratio, feedback factor (β), Input resistance Rif, output resistance Rof. **10**

5. (a) For the differential amplifier shown in **figure**, determine — **10**

(i) I_{CQ}, V_{CEQ}
(ii) Differential gain A_d
(iii) Common Mode gain A_c and
(iv) CMRR

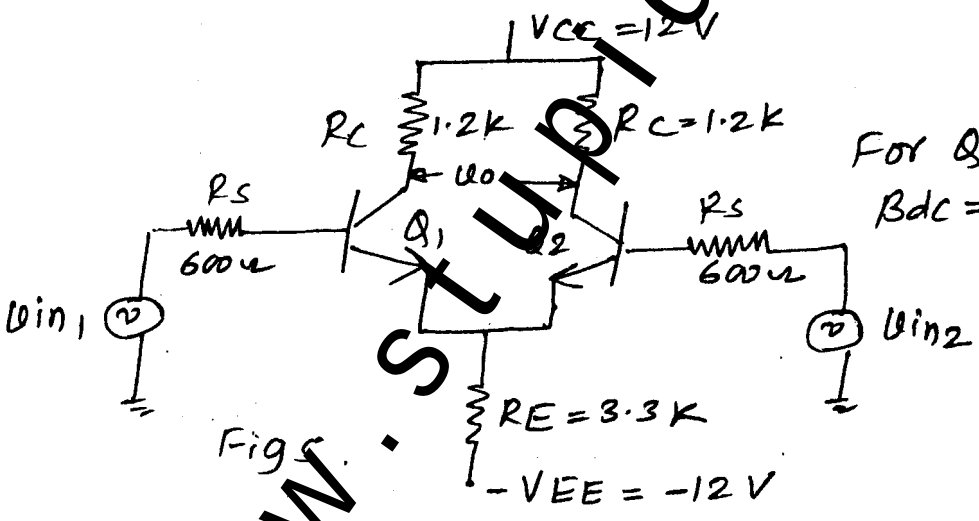

Fig 5

(b) Draw transistorized Astable Multivibrator and explain its working with waveforms at important nodes. **10**

6. (a) Draw circuit diagram of RC phase shift BJT oscillator and derive expression for frequency of socillation. **10**

(b) Design a large signal transformer coupled class A power amplifier to provide 10 W output to the 4 Ω load. **10**

7. Write short notes on any **four** :— **20**

(a) Cascode Amplifier
(b) High input impedance circuits
(c) High frequency LC oscillator
(d) Class AB push-pull power amplifier
(e) Schmitt trigger.

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DBEC DATA SHEET

Transistor type	Pdmax @ 25°C Watts	Icmax @ 25°C Amp	$V_{CE(sat)}$ 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	D.C. current gain typ.	D.C. current gain max.	Small Signal h_{fe} min.	Small Signal h_{fe} typ.	Small Signal h_{fe} max.	V_{BE} max.	θ_{jc} °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	500 Ω	—	—	—
ECN 149	250 Ω	—	—	—
ECN 055	100 Ω	—	—	—
2N 3055	25 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