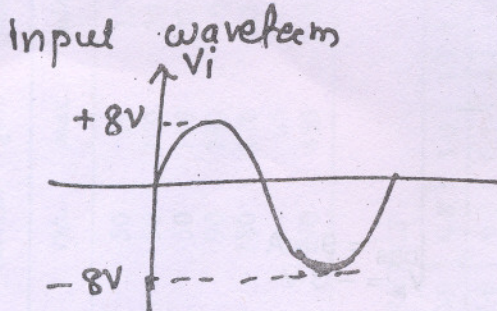
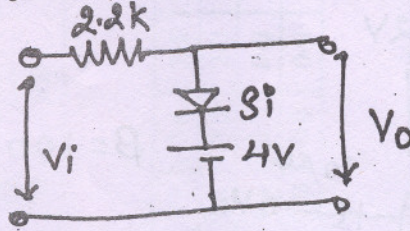
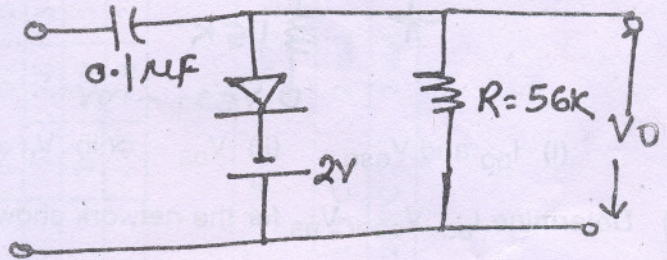
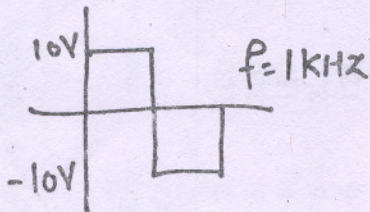


- N.B.(1) Question No. 1 is compulsory.
 (2) Attempt any four out of remaining six questions.
 (3) Assume suitable data wherever required and justify the same.

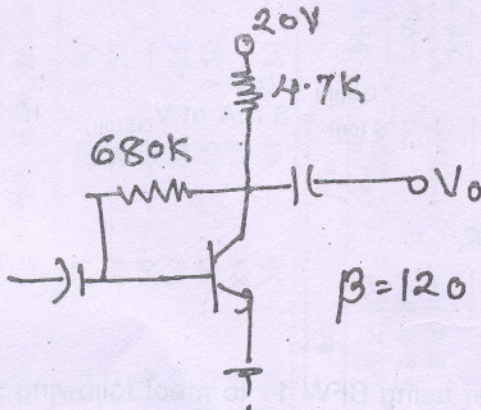
1. (a) Describe series and shunt clipper with neat circuit diagrams. Also draw proper waveforms. 5
 (b) (i) Draw output waveform V_o for following circuit. 3



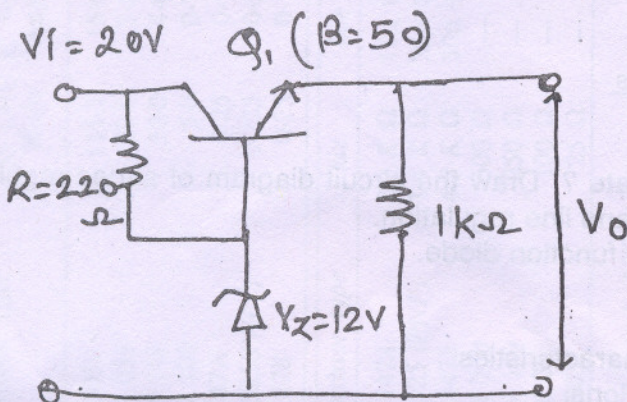
- (ii) Sketch output voltage V_o . 2



- (c) Determine V_{CEQ} and I_{CQ} for the following circuit. 5



- (d) Calculate output voltage and zener current for the circuit given below :- 5

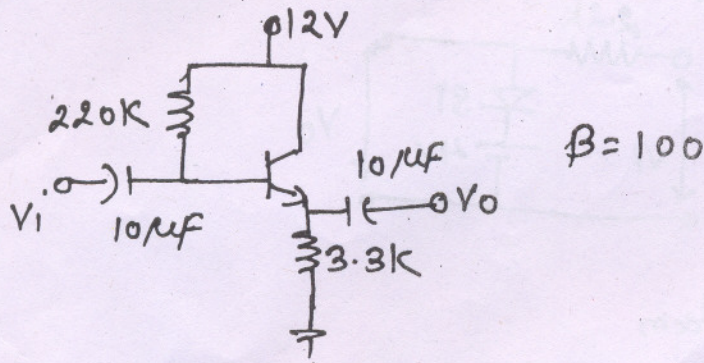


2. Design a single stage RC coupled CE amplifier for low frequency range 10 Hz to 20 KHz to give voltage gain $A_V \geq 100$ with stability factor $S \approx 10$ and output voltage $V_o = 2.5$ V (rms). Use BC 147 B and specify V_{CC} required. Calculate A_V , R_i , R_o of designed circuit. 20

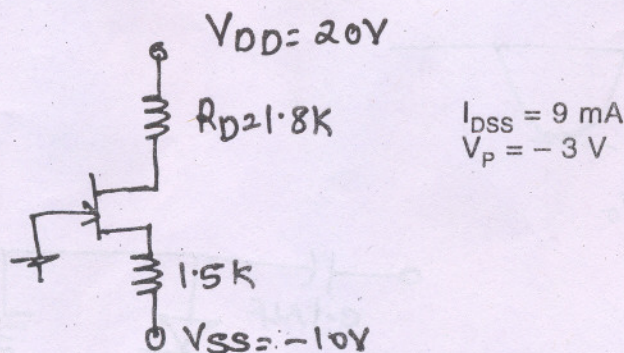
3. (a) Draw a circuit diagram for Emittee follower. Draw h-parameter model for this config. Derive expression for A_V , R_i , R_o using h parameter model. Why this config. is used as buffer amplifier? 12

(b) Calculate following for given circuit :—

(i) V_o (ii) Z_i (iii) Z_o (iv) A_V (v) A_i . 8

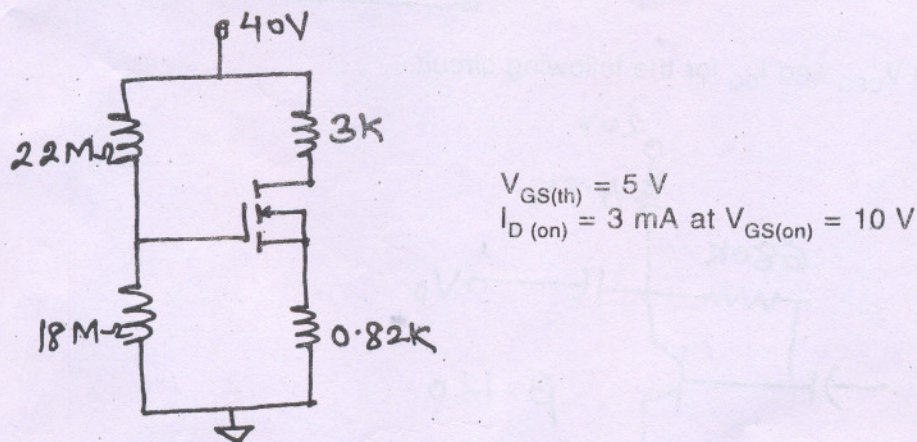


4. (a) Determine following for the given network :— 8



(i) I_{DQ} and V_{GSQ} (ii) V_{DS} (iii) V_D (iv) V_S .

(b) Determine I_{DQ} , V_{GSQ} , V_{DS} for the network shown :— 12



5. Design a single stage RC coupled CS amplifier using BFW 11 to meet following specifications 20

$|A_V| = 9$ ac output $V_o = 2.5$ V (rms)

with biasing circuit to give —

(a) Zero temperature drift

(b) To operate FET at $I_{DQ} = \frac{I_{DSS}}{2}$.

6. (a) What is the application of regulate? Draw the circuit diagram of series regulator. Derive expression of output impedance and line regulation. 16

(b) Compare — PIN diode and P-N function diode. 4

7. Write short notes on :— 20

(a) Working of SCR and its characteristics

(b) Photodiode and its applications.

DBEC DATA SHEET

| Transistor type | P_{dmax} | I_{cmax} | $V_{CE}^{(sat)}$ | V_{CBO} | V_{CEO} | V_{CER} | V_{CEX} | V_{BEO} | T_j max | D.C. | current | gain | Small | Signal | h_{fe} | V_{BE} | θ_{jc} | Derate |
|-----------------|------------|------------|------------------|-----------|------------|------------|-----------|-----------|-----------|------|---------|------|-------|--------|----------|----------|---------------|--------|
| | @ 25°C | @ 25°C | volts | volts | (SUS) | (SUS) | volts | volts | | | | | | | | | | |
| | Watts | Amps | d.c. | d.c. | volts d.c. | volts d.c. | d.c. | d.c. | | | | | | | | | | 25°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 | h_{ie} | h_{oe} | h_{re} | θ_{ja} |
|-----------------|----------------|-------------------|----------------------|---------------|
| BC 147A | 2.7 K Ω | 18 μ Ω | 1.5×10^{-4} | 0.4°C/mw |
| 2N 525 (PNP) | 1.4 K Ω | 25 μ Ω | 3.2×10^{-4} | — |
| BC 147B | 4.5 K Ω | 30 μ Ω | 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

| -V _{GS} 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 |
|-------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| I _{DS} 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 |
| I _{DS} 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 |
| I _{DS} 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. | V_{DG} max. | V_{GS} max. | P_d max. | T_j max. | I_{DSS} | g_{mo} | $-V_p$ Volts | r_d | Derate | θ_{ja} |
|------------------|---------------|---------------|---------------|------------|------------|-----------|---------------------|--------------|---------------|------------|---------------|
| | Volts | Volts | Volts | @25°C | °C | | (typical) | | | above 25°C | |
| 2N3822 | 50 | 50 | 50 | 300 mW | 175°C | 2 mA | 3000 μ Ω | 6 | 50 K Ω | 2 mW/°C | 0.59°C/mW |
| BFW 11 (typical) | 30 | 30 | 30 | 300 mW | 200°C | 7 mA | 5600 μ Ω | 2.5 | 50 K Ω | — | 0.59°C/mW |