Q.P. Code: **40107**

(3 Hours)   [Total Marks: 80]

N.B.   (1) Question No. 1 is **compulsory.**
       (2) Solve any **three** questions from remaining **five** questions.
       (3) **Figures** to the right indicate **full marks**.
       (4) Assume suitable data if necessary and mention the same in answer sheet.

1.   Attempt any **Four** of the following: 20
   (a) Draw a neat labelled diagram of Depletion Type MOSFET and explain its operation.
   (b) Find the value of I_E and V_{CE} for the given Darlington configuration:
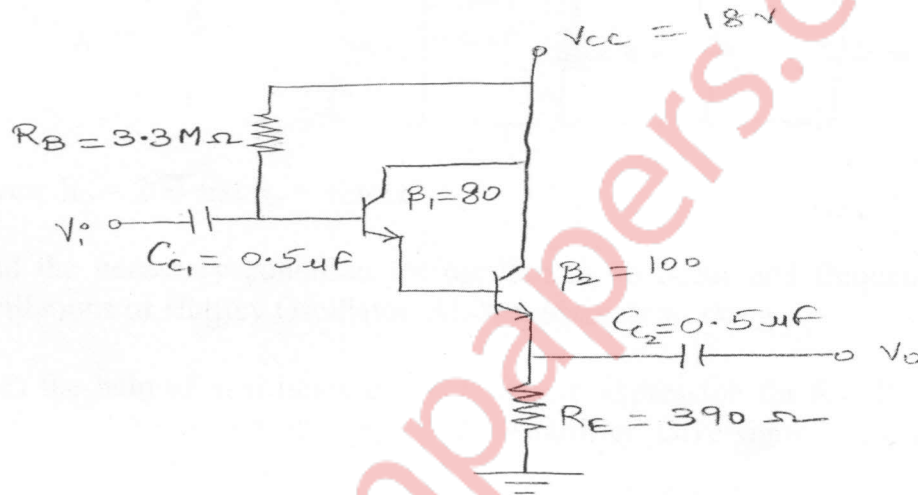
Given: $\beta_1 = 80$, $\beta_2 = 100$, $V_{BE} = 1.6V$.

   (c) Differentiate Small Signal Amplifier and Large Signal Amplifier.
   (d) State Barkhausen's Criteria and explain basic principle of an Oscillator.
   (e) Give the advantages of negative feedback.

2. (a) Design a two stage RC coupled CS Amplifier to meet following   15
       specifications: $A_v \geq 100$, $V_o = 4V$, $I_{DQ} = 1.2$ mA, $f_L = 20$ Hz.

       Assume: $g_{mo} = 5$m$\mho$, $I_{DSS} = 7$mA, $r_d = 50$kΩ, $V_P = -4V$. Assume suitable V_{DD}.

   (b) Compare RC Coupled, Direct Coupled and Transformer Coupled   05
       Amplifiers.

3. (a) Determine input impedance, output impedance, voltage gain and current **10** gain for the given cascaded BJT amplifier as shown in the figure below:
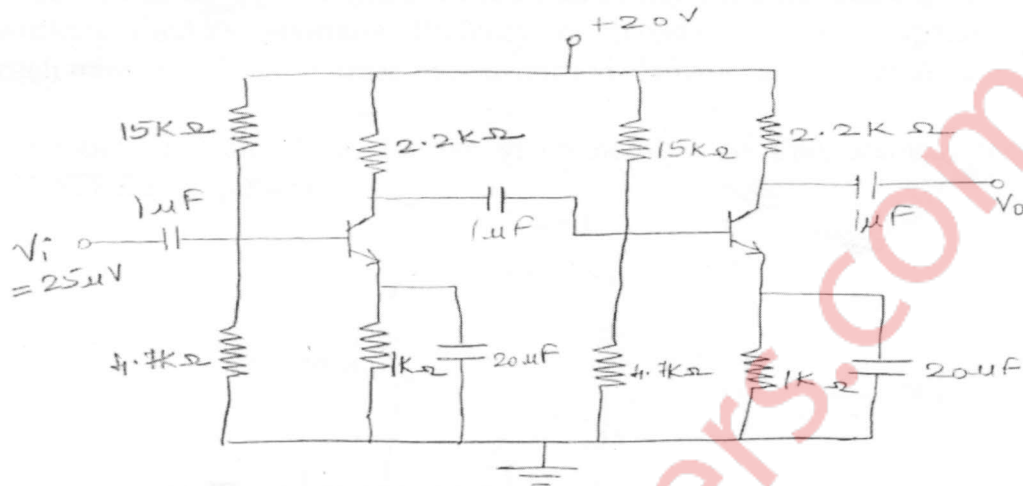

Given: $h_{fe} = 200$ and $h_{ie} = 1.3k\Omega$.

(b) Find the necessary condition for oscillations to occur and frequency of **10** oscillations of Hartley Oscillator. Also, explain its working.

4. (a) With the help of neat block diagram, derive expression for R_{IF}, R_{OF}, G_{mF} **08** for Current Series Negative Feedback Amplifier. Give significance of the above mentioned parameters.

(b) For the circuit shown below, determine the following: **12**
 i. R_S
 ii. Q-point of each stage.
 iii. AC equivalent model.
 iv. Lower Cut-off Frequecny (f_L).
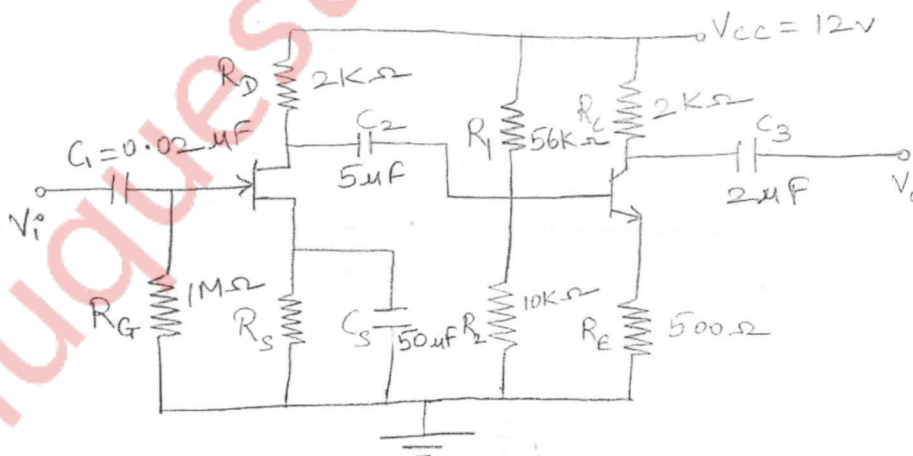
Given: $V_{GS} = -1V$, $I_{DSS} = 8mA$, $V_P = -4V$ for JFET and $h_{ie} = 1k\Omega$, $h_{fe} = 100$, $V_{BE} = 0.6V$ for BJT.

5. (a) Design an RC phase shift Oscillator to generate 5kHz sine wave with 20V **10** peak to peak amplitude. Assume h_{fe} = 150 and h_{ie} = 1kΩ.

   (b) Draw circuit diagram of Class B Push Pull Power amplifier and explain its **10** working. Find its maximum efficiency and maximum power dissipation in each transistor. What is cross-over distortion? How it can be overcome?

6. (a) Determine I_{DQ} and V_{DSQ} for the given network of Enhancement type **05** MOSFET arrangement.
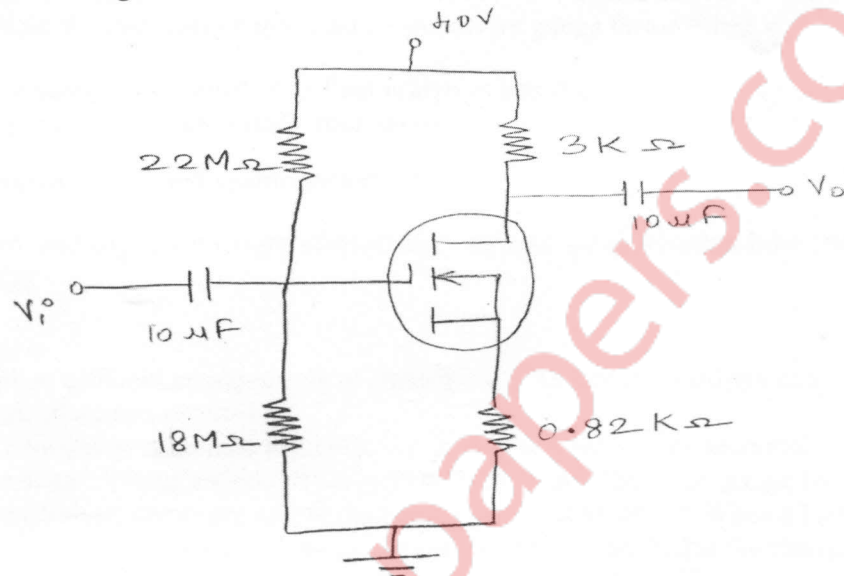
   Given: $I_D(ON)$ = 3mA, $V_{GS}(ON)$ = 10V, $V_{GS}(Th)$ = 5V.

   (b) In Colpitts Oscillator, C_1 = 0.2µF, C_2 = 0.02µF. If the frequency of **05** oscillator is 10 kHz, find the value of inductor. Also, find the required gain for oscillation.

   (c) Write a Short Note on: Cascode Amplifier. **10**

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