QP CODE : 22626

(3 Hours)   Marks : 80

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

(2)   Solve any three questions from the remaining five

(3)   Figures to the right indicate full marks

(4)   Assume suitable data if necessary and mention the same in answer sheet.

Q.1   Attempt any 5 questions   [20]
a) Compare ideal and practical opamp
b) What is crossover distortion in power amplifier. How is it overcome?
c) Define differential and common mode gain and differential and common mode input impedance of differential amplifiers.
d) Daw the circuit diagram of widlar current source and derive the relationship between output current and reference current.
e) Draw high frequency hybrid pi equivalent of BJT and define the various components in the model.
f) Explain line regulation and load regulation of voltage regulator. Draw the line and load regulation characteristics of ideal and practical voltage regulator.

Q.2   a) For the circuit shown in Fig. 2a find midband gain and corner frequencies.   [10]
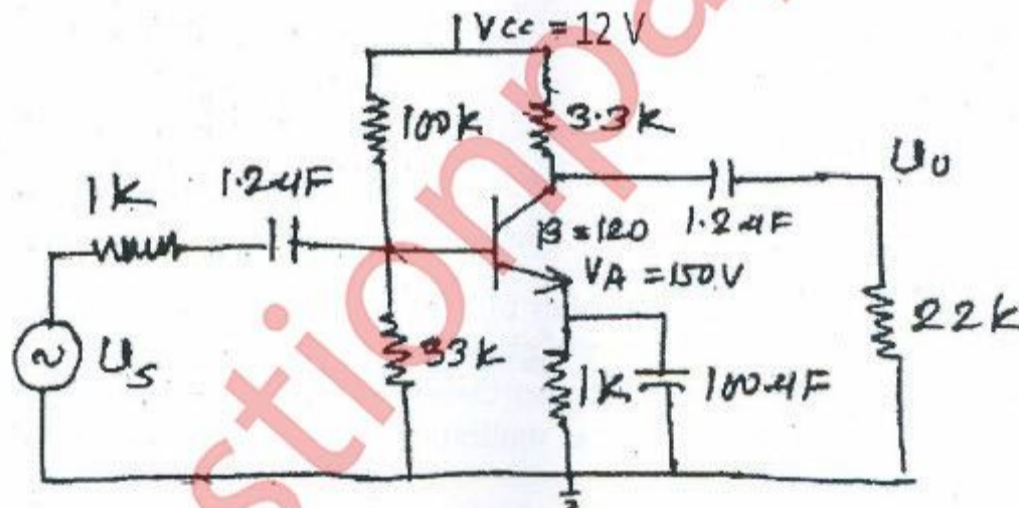

Fig.2a

b) Determine unity gain bandwidth of N channel MOSFET with parameters   [10]
$K_n = 0.25$ mA/V^2, $V_{TN} = 1$V, $\lambda=0$, $C_{gd} = 0.04$ pF, $C_{gs} = 0.2$ pF, $V_{GS} = 3$V. If a 10 kΩ load is connected to the output between drain and source determine the Miller capacitance and cut-off frequency.

Q.3   a) Draw circuit diagram of MOSFET based differential amplifier and derive   [10]
the expression for differential gain, common mode gain and CMRR.
b) For the circuit shown in Fig. 3b, find overall mid band voltage gain and   [10]
capacitors C_{C1} and C_{C2} such that the 3 dB frequencies associated with each stage are equal. Assume BJT to have parameters $V_{BE (on)} = 0.7$ V, $\beta = 200$ and $V_A = \infty$
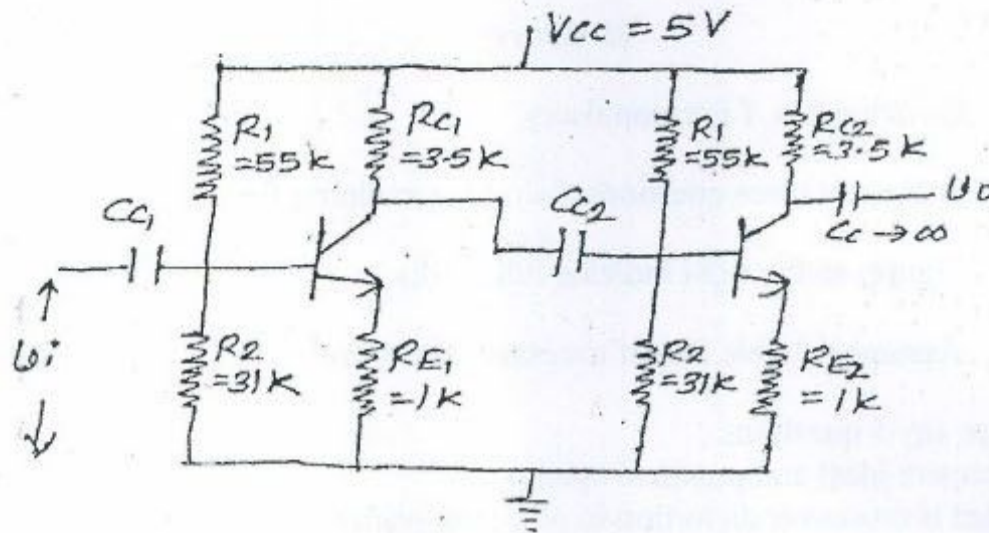
Fig. 3b

Q.4 a) Draw and explain current mirror circuit using MOSFET. For the circuit [10] shown in Fig. 4a determine the value of I_{ref} and I_0.
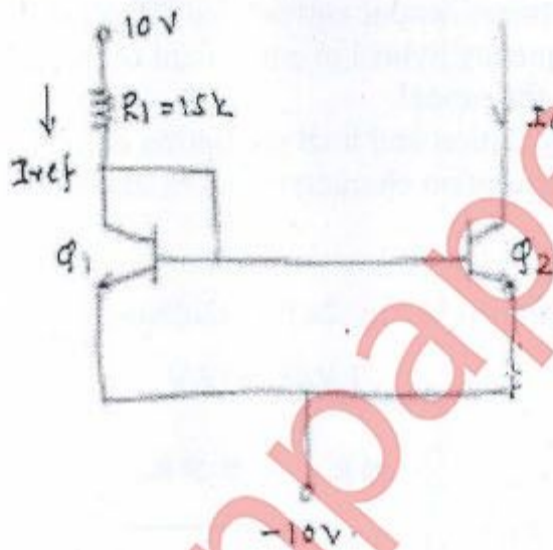

Fig.4a

b) What are the ideal characteristics of opamp and also explain the effect of [5] high frequency on OPAMP gain and phase.

c) Draw the circuit of V_{BE} multiplier biased class AB amplifier and explain [5] the working and advantages of V_{BE} multiplier biased class AB amplifier.

Q.5 a) Draw the circuit diagram of transformer coupled class A power amplifier. [10] Also draw ac and dc loadlines for the same. Derive the expression for its power conversion efficiency.

b) Explain the working of basic differentiator with the help of input and output [10] waveforms. Also derive the expression for the output voltage. What are the limitations of basic differentiator and how to overcome these limitations.

Q.6 Short notes on: (Attempt any four) [20]
   a) Transistorised series regulator
   b) Power MOSFET
   c) Class AB power amplifier
   d) Active filters
   e) Multistage amplifiers

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