TEC502

B.Tech

(SEM V) ODD SEMESTER THEORY EXAMINATION 2009-10
ANALOG INTEGRATED CIRCUITS

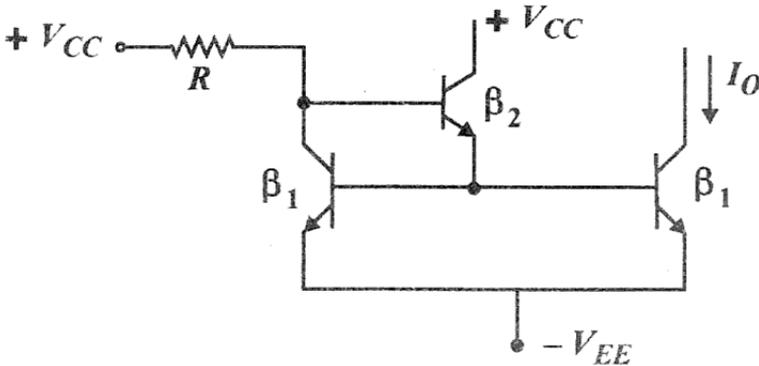*Time : 3 Hours]*   *[Total Marks : 100*

Note :   *Attempt all questions.*

1   Answer any **two** of the following :   10×2=20

   (a)   Derive the expression for I_0 in the following circuit.

   Also find the output impedance.

   (b)   Draw the output stage of a $741-C$ op-amp and explain how it protects the op-amp against short circuit. Also derive the output impedance.

(c) Explain the working of a CC level shifter and give proper reasons as to why the lower resistance in emitter is replaced by a current mirror.
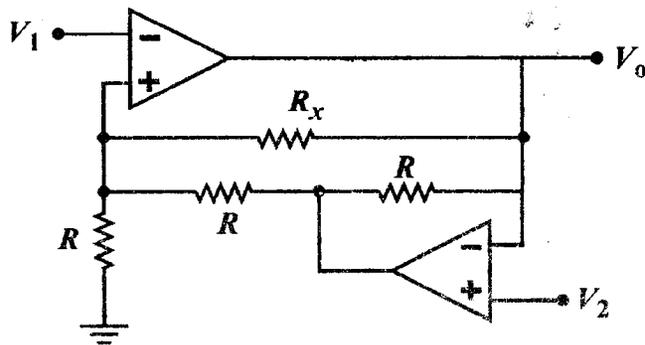
2 Answer any **two** of the following : $10 \times 2 = 20$

(a) Design a 741-C based INV amplier for $A_v = -20$ such that the circuit offers maximum input impedance. Given

$$V_{os(max)} = 6\,mV \quad \text{and} \quad (R_1 \,||\, R_2)$$

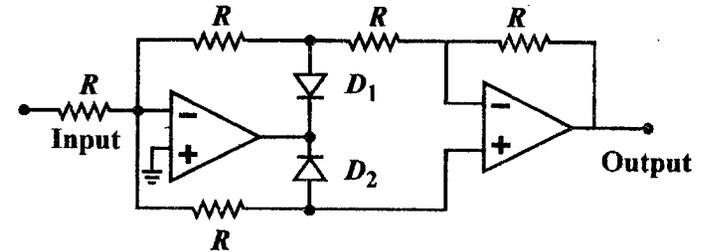$$I_{os(max)} = 9\,mV \quad \text{where}$$

$$I_{os(max)} = 260\,nA.$$

(b) Calculate V_0 in the following circuit :
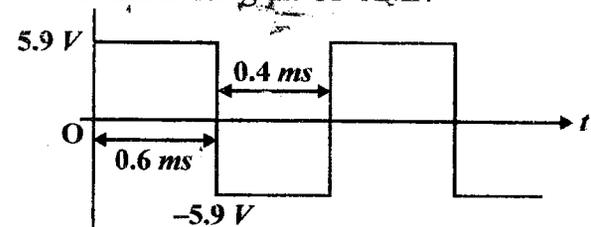

(c) Design a biquad filter with $f_0 = 8\,kHz$, $BW = 250\,Hz$ and a 20-dB response gain. What is the value of H_{OLP} ?

3 Answer any **two** of the following : $10 \times 2 = 20$

(a) Explain the working of the following circuit and draw its output wave form if input is a $\pm 5V$ sine. Assume D_1, D_2 to be ideal.

(b) It is required to generate the following waveform using an OP-AMP.

Design a circuit.

(c) Draw an OP-AMP based Monostable multivibrator and explain its working.

4 Answer any **two** of the following : $10 \times 2 = 20$

(a) Design a LM 723 based voltage regulator with following parameters :
(i) Input voltage (16V-20V)
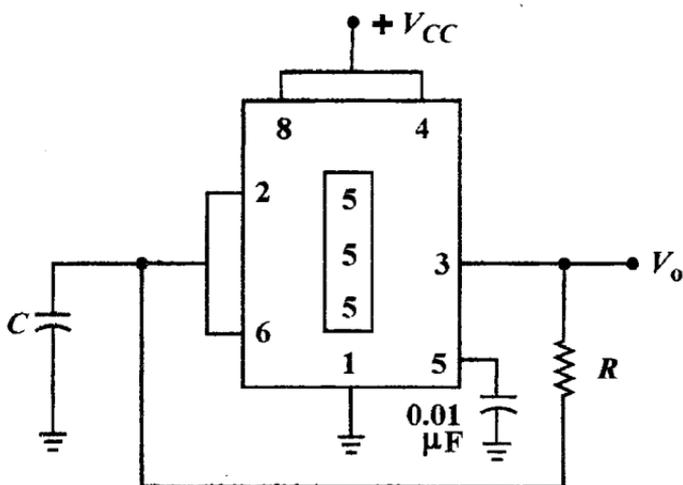(ii) Output voltage = 6V
(iii) $I_{L\,(max)} = 250\,mA$
(iv) $I_{sc} = 75\,mA$

(b) Explain the basic principle of SMPS. List the merits and demerits.

(c) Draw the internal circuit of an off the shelf bipolar OTA and explain its working.

5 Answer any two of the following : $10 \times 2 = 20$

(a) Explain the working of the following circuit :

(b) It is required to generate a frequency 4f from an input frequency of f. Suggest a circuit and explain its working.

(c) Design an OP-AMP based amplifier to give a voltage gain of 2, 3, 5 and 9 depending upon the status of 2 digital inputs X_1 and X_2.