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EC–309

ULSE & DIGITAL SWITCHING CIRCUITS (NEW)

(B.Tech., 5th Semester, 2055)

: 3 Hours

Maximum Marks : 60

:– Section A is compulsory. Attempt any *Four* questions from Section B and any *Two* questions from Section C.

Section–A

Marks : 2 Each

(a) What are the disadvantages of RL linear waveshaping circuit compared to RC circuit ?

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(b) Draw V-I characteristics of an ideal diode.

(c) Sketch diagram of a circuit that will clip all levels below –20 V and above 30 V.

(d) What are advantages and disadvantages of symmetrical and unsymmetrical triggering ?

(e) Why step input amplifier response is not flat tapped ?

(f) List uses of distributed amplifier.

(g) How Schottkey diode reduces storage time in transistor ?

(h) Describe clamping circuit theorem.

(i) Draw transistor based circuit diagram of Schmitt trigger.

(j) Design astable multivibrator using OP-AMP ?

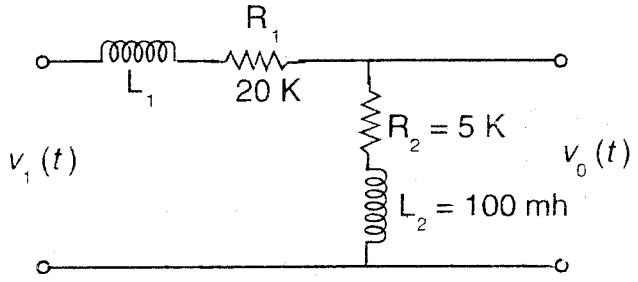
Section–B Marks : 5 Each

2. **Obtain** the response of a low pass circuit to a **ramp** input. Discuss the effect of RC on the **response**.

3. **Find** the output response of the circuit :

(a) if input is a 100 V peak to peak square wave having a period of 200 μs if L_1 = 100 mh.

(b) 500 mh.



4. At low frequencies the short circuit CE current gain β is related to short-circuit CB current gain α by :

$$\alpha = \frac{\beta}{1+\beta}$$

Assuming this relationship remains valid at high frequencies and using $\beta = -A_i$, prove that :

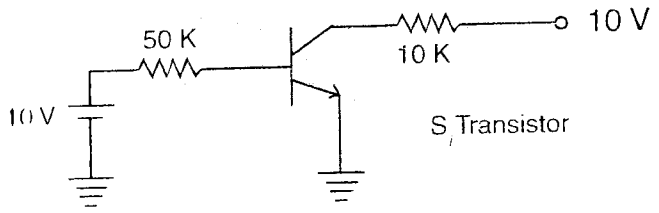
$$\alpha = \frac{\alpha_0}{1 + j\left(\frac{f}{f_\alpha}\right)}$$

where

$$a_0 = \frac{h_{fe}}{1 - h_{fe}} \text{ and } f_\alpha = \frac{f_\beta}{1 - \alpha_0}.$$

A_i = Current amplification under short circuit condition.

5. Find the value of minimum h_{fe} required to saturate the transistor.



6. With the help of diagram, explain the operation of Bistable Multivibrator.

Section–C Marks : 10 Each

7. Explain the working of a practical Boot strap time base generator. Sketch the output voltage waveshape and calculate the slope error.

8. (a) A fixed bias binary uses *npn* Silicon transistors with $h_k = 20$, $V_{CC} = 12$ V, $V_{BB} = 3$ V, $R_C = 1$ K, $R_1 = 5$ K, $R_2 = 10$ K.

Verify one transistor is cutoff and other transistor is saturation. Find stable currents and voltages if :

(i) $V_{CE\ (sat)} = V_{BE\ (sat)} = 0$

(ii) $V_{CE\ (sat)} = 0.4$ V $\quad V_{BE\ (sat)} = 0.8$ V

(b) Find the input impedance of RC differentiating circuit. Is it same as that of RL differentiating circuit. 6,4

9. Design an Astable multivibrator using transistors and explain its action. Sketch

waveform at various points. Design an Astable circuit using Ge transistors to generate a square waveform of amplitude 10 V at a frequency of 10 kHz with a duty cycle of 0.4. Choose $C_1 = C_2 = 0.01$ μF.