

Total number of printed pages – 7 B. Tech  
CPEC 5306

Sixth Semester Examination – 2007

ADVANCED ELECTRONICS CIRCUITS

Full Marks – 70

Time : 3 Hours



Answer Question No. 1 which is compulsory and any **five** from the rest.

The figures in the right hand margin indicate full marks for the questions.

1. Answer the following questions : 2×10
  - (a) What do you mean by frequency response ? Write down the importance of frequency response during design of a filter.

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- (b) Differentiate between low pass, high pass, band pass, band reject, and all pass filters with its practical applications.
- (c) Distinguish between wide band and narrow band filters.
- (d) Define 'stable state of a binary'. Write down the conditions required to maintain the stable state.
- (e) What is commutating capacitor? Why and where is it used?
- (f) Compare between backward diode and conventional diode.
- (g) A 555 timer can be used as a monostable astable multivibrator. Justify.
- (h) Describe merits of digital PLL over analog PLL.
- (i) How biasing affect the operation of multivibrators?

- (j) A certain narrow band-pass filter has been designed to meet the following specifications :  $f_c = 2 \text{ kHz}$ ,  $Q = 20$  and  $A_v = 10$ . What modifications are necessary in the filter circuit to change the center frequency  $f_c$  to  $1 \text{ kHz}$  keeping the gain and bandwidth constant?

2. (a) Design a wide band-pass filter with  $f_l = 450 \text{ Hz}$ ,  $f_h = 3 \text{ kHz}$ , and passband gain = 4. Also draw an approximate frequency response plot for the filter. 5
- (b) Draw the schematic diagram of a triangular wave generator. Also draw the input and output waveforms. 5
3. (a) Explain the operation of unsymmetrical triggering and symmetrical triggering of the binary. 5
- (b) Describe the operation of collector coupled monostable multivibrator and draw its waveform. 5

4. (a) Draw the characteristics for voltage-controlled negative-resistance switching circuits. 5

(b) Find out the expression for rise time of cascaded stages. 5

5. (a) Explain operation and characteristics UJT. 5

(b) (i) A relaxation oscillator using an UJT, shown in the fig.5b, is to be designed for triggering an SCR. The UJT has the following data:  
 $\eta = 0.72$ ,  $I_p = 18.0 \text{ V}$ ,  $V_v = 1.0 \text{ V}$ ,  
 $I_v = 2.5 \text{ mA}$ ,  $R_{BB} = 5 \text{ k}\Omega$ , Normal leakage current with emitter open = 4.2 mA.

The firing frequency is 2 kHz. For  $C = 0.04 \mu\text{F}$ , compute the values of  $R_1$ ,  $R_2$ , and  $R_3$ .

(ii) If the firing frequency of the SCR is changed by varying resistor  $R$ , obtain the maximum and minimum values of  $R$  and the corresponding frequencies. 5

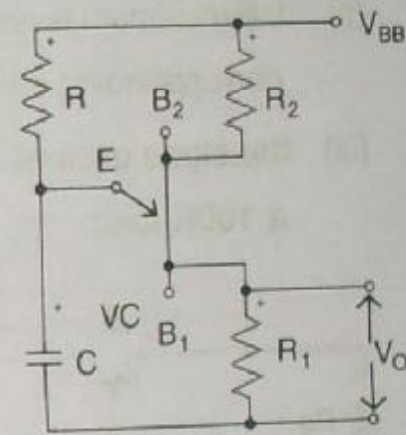


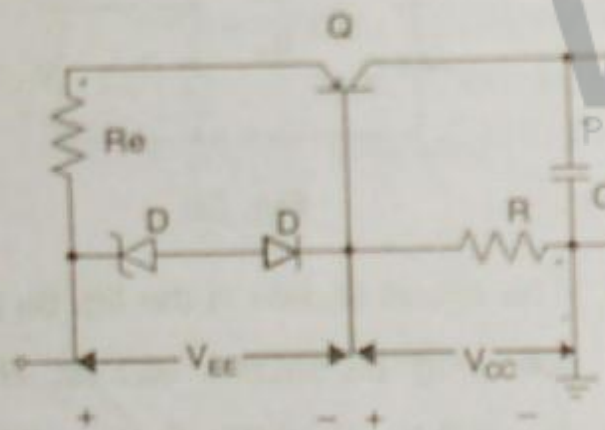
Fig. 5b

6. (a) The circuit shown in the fig. 6a has the following parameter values:  $R_e = 1\text{K}$ ,  $R = 6.8 \text{ K}$ ,  $C = 0.05 \mu\text{F}$ ,  $V_{YY} = 24 \text{ V}$ , and  $V_z = 8.0\text{V}$ . The transistor CB h-parameters are  $\alpha = 0.98$ ,  $h_{ib} = 20\Omega$ ,  $h_{rb} = 3 \times 10^{-4}$ ,

$h_{re} = 0.5 \mu\text{mho}$ . The temperature coefficient of the avalanche diode is 0.002 per cent/ $^{\circ}\text{C}$ . All the devices are silicon.

Calculate

- (i) the sweep speed
- (ii) the maximum sweep voltage and the corresponding sweep duration
- (iii) the slope error at no load and with a 100K load.



A constant-current sweep circuit involving temperature compensation. 5

(b) Briefly write down about instrumentation amplifier and its application. 5

7. (a) Describe 555 timer as an astable multivibrator. 5

(b) Derive the expression for free-running frequency  $f_{OUT}$ , the lock range  $f_L$  and the capture range  $f_C$ . 5

8. Write notes on : 5x2

(a) Tunnel diode

(b) Time base generator.

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