B.E. (Electronics Engineering / Elect. Telecommunication / Elect. Communication Engineering)
Fifth Semester (C.B.S.)

Analog Circuits & Design

P. Pages : 3 **NRT/KS/19/3410/3415**

Time : Three Hours * 0 1 3 3 * Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data whenever necessary.
10. Illustrate your answers whenever necessary with the help of neat sketches.
11. Use of non programmable calculator is permitted.

1. a) Draw and explain the block diagram of an OPAMP. **6**

b) Design dual input balance output differential amplifier for the following specifications. **7**

$R_C = 2.2\,k\Omega$

$R_E = 4.7\,k\Omega$

$V_{CC} = +15V$

$V_{EE} = -15V$

and transistor having $\beta = 100$ and $V_{BE} = 0.6V$.

Determine :

i) I_{CEQ} and V_{CEQ}

ii) The voltage gain

iii) Input and Output resistance

OR

2. a) Define : **6**

i) CMRR ii) Slew Rate

iii) Input offset voltage iv) Gain B.W. product

b) For an inverting amplifier following data are given - **7**

$A = 2 \times 10^5$; $R_i = 2\,M\Omega$, $R_0 = 75\,\Omega$, $R_1 = 470\,\Omega$, $R_F = 4.7\,k\Omega$, $U_{GB} = 1\,MHz$

Supply volt is $\pm 15V$, maximum output volt saving = $\pm 13V$

Calculate :

i) Closed loop gain

ii) I/P resistance with feedback

iii) Output resistance with feedback

iv) Bandwidth with feedback volt

3. a) Develop adder substractor circuit to give $V_0 = -4V_1 - 2V_2 + 10V_3 + V_4$ assume feedback resistance $R_F = 100\,k\Omega$ **7**

b) Draw the circuit of practical temp. compensated logarithmic amplifier and derived an expression for output voltage. **7**

OR

4. a) Design an OPAMP differentiator that will differentiate an input signal in the frequency range 500 Hz to 2500 Hz. Also draw the output waveform for the designed circuit if input is 1V peak at 2000 Hz (sine wave) **8**

b) Draw the circuit of instrumentation amplifier using three OPAMP and derive the expression for output voltage. **6**

5. a) Draw the circuit diagram and explain the working of precision full wave rectifier. Derive the expression for output voltage. **7**

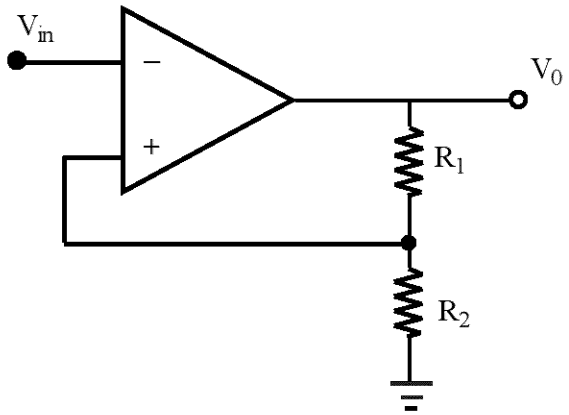
b) For a Schmitt trigger using OPAMP as shown in fig. **6**

$R_1 = 50\,k\Omega$

$R_2 = 1k\Omega$

find the value of V_{LT}, V_{uT} and V_H

Draw the Hysteresis curve, $\pm V_{sat} = \pm 12$



OR

6. a) Short note on : **6**

i) Sample / Hold Circuit.

ii) Monostable Multivibrator using IC 555.

b) Draw and explain R – 2R ladder type D to A converter. **7**

7. Design a S.V.R. to give $V_0 = 12V$ at $350\,mA, V_i = 26 \pm 15\%, r_0 = 2\,\Omega$, $h_{fe_1} = 40, h_{fe_2} = 100$. Find the value of S_V and R_0. **14**

OR

8. Design a step down SMPS to give 5V, $I_0 = 8A$ unregulated input is 20V. Switching frequency is 25 kHz assume reference volt is 2V. $V_{sat} = 1.2V, t_{sw} = 1.1\mu sec$ and $U_{DON} = 1V$. The output ripple should be limited to less than 80mV (P.P). Also calculate efficiency of SMPS. **14**

9. a) Design RC phase shift oscillator for the following specification : $V_0 = 8V$ (peak – peak) freq. of oscillation is 10 kHz. Also determine frequency shift if phase shift of 1^o is introduced in the loop. **7**

b) Derive an expression for figure of merit for Hartley Oscillator. **6**

OR

10. Design diode function generator to simulate, the range of input is 0v to 10v where X is input and V_0 is output. Define four break points at 1, 2, 4, 6V. **13**

11. a) Design a Butterworth filter such that the attenuation is less than 2dB for frequency, less than 400 Hz and attenuation is greater than 20 dB for frequency greater than 4 KHz. **8**

b) State the advantages of active filter over passive filter. What is order of filter? **5**

OR

12. a) Write short note on design of relay driver circuit. **5**

b) Write short note on stepper motor control circuit. **4**

c) What is difference between D.C. motor and Servo motor. **4**

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