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

Analog Circuits & Design

P. Pages : 2 **NRJ/KW/17/4465/4470**

Time : Three Hours * 0 4 0 2 * 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.

1. a) Draw equivalent circuit of Op-Amp and List the ideal characteristics of an Operational amplifier. **5**

b) Define following parameters as applied to an OP-AMP. **8**
i) CMRR (Common Mode Rejection Ratio) ii) PSRR
iii) Slew Rate iv) Input offset current.

OR

2. a) Design a dual input balanced output differential amplifier with a constant current bias (Using diodes) to satisfy the following requirements. **8**
Differential voltage gain, $A_d = 40 \pm 10$ current supplied by the constant current bias circuit = 4mA, supply voltage = $\pm$ 10V.

b) For an inverting amplifier following data are given: **5**
$A = 2x10^5$, $R_i = 2M\Omega$, $R_o = 75\Omega$, $UGB = 1MHz$ Supply voltage = $\pm$ 15 V. Compute closed loop parameters A_f, R_{if}, R_{of}, F_f & V_{ooT}.

3. a) What are the advantages of Instrumentation amplifier? Draw the circuit of differential amplifier with three OP-AMPs and derive the expression for its output voltage. **7**

b) Design an Op-Amp differentiator that-will differentiate an input signal in the frequency range 500Hz to 2500Hz. Also draw the out-put waveform for the designed circuit if input is 1V peak at 2000Hz (sine wave). **7**

OR

4. a) Draw the circuit of practical temperature compensated logarithmic amplifier and derive the expression for o/p voltage. **8**

b) Design the Op-Amp circuit which can give the output as : $V_0 = 2V_1 - 3V_2 + 4V_3 - 5V_4$, Assume feedback resistance $R_f = 100k$ **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 OP-Amp shown in fig. $R_1 = 50\,k\Omega \& R_2 = 1k\Omega. \pm V_{sat} = 12V$ **6**

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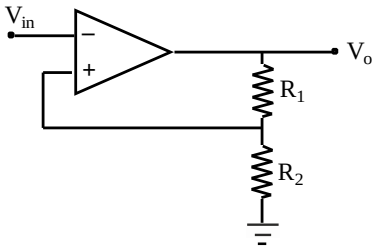

Find the value of $V_{LT}, V_{UT} \& V_H$ .Draw Hysteresis curve.

OR

6. a) Draw the circuit diagram of IC 555 as table multivibrator to generate the output signal with frequency 2kHz & duty cycle of 75%. **7**

b) Draw & Explain R-2R Ladder type D to A converter. **6**

7. Design a stepdown SMPS to give 5V, Io = 8 AMP unregulated input is 20V. Switching frequency is 25 kHz. Assume reference voltage is 2V. V_{sat} = 1.2 V, tsw = 1.1 μ sec & $V_{DON} = 1V$. The output ripple should be limited to less than 80mV $(p-p)$. Also calculate efficiency of SMPS. **13**

OR

8. Design a series voltage regulator to give $V_o = 12V$ at 350mA. $V_i = 26v \pm 15\%$, $r_o = 30hm$, $h_{fe1} = 40$ $h_{fe2} = 100$. Find the values of $S_v \& R_o$. **13**

9. a) Derive equation for frequency of oscillation and figure of merit for Hartley oscillator. **7**

b) Design RC phase shift oscillator to give frequency of oscillation 12kHz. The peak to peak output should be 10V. **7**

OR

10. a) Derive expression for frequency of oscillation and figure of merit for Wein Bridge oscillator. **7**

b) Design a Wein bridge oscillator for $f_o = 5$ kHz & $V_{op-p} = 14V$. **7**

11. a) Design a Butterworth filter such that relative attenuation is less than 2dB for frequencies less than 400Hz & the attenuation is greater than 20dB for frequency greater than 4kHz **7**

b) Design 4th order high pass filer with cut-off frequency of 8kHz. [Assume C=0.1 μ F] **6**

OR

12. a) Design a band pass filter so that centre frequency $F_o = 2kHz$, $Q = 6$ & $A_F = 10$. Choose $C_1 = C_2 = 0.01\,\mu F$. **7**

b) Write short note on "Design of relay driver circuit". **6**

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