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[5152]-536**S.E. (E&TC/Electronics) (II Sem.) EXAMINATION, 2017****INTEGRATED CIRCUITS****(2015 PATTERN)****Time : Two Hours****Maximum Marks : 50**

- N.B. :-** (i) Answer Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6, and Q. No. 7 or Q. No. 8.
- (ii) Neat diagrams must be drawn wherever necessary.
- (iii) Figures to the right indicate full marks.
- (iv) Use of calculator is allowed.
- (v) Assume suitable data, if necessary.

1. (a) Define the following characteristics of Op-amp : [6]
- (i) Input bias and offset current
- (ii) CMRR
- (iii) Bandwidth
- (iv) Slew Rate.
- (b) Draw an Inverting Summing amplifier with three input. Derive an expression for its output voltage : [6]

$$V_0 = - (V_a + V_b + V_c)$$

P.T.O.

Or

2. (a) An emitter biased Dual input balanced output differential amplifier has the following specifications : [6]

$V_{CC} = -V_{EE} = 10 \text{ V}$, $R_{C1} = R_{C2} = 2.7 \text{ k}\Omega$ and $R_E = 5.6 \text{ k}\Omega$, Transistor array is CA3086 with $\beta_{ac} = \beta_{dc} = 100$ and $V_{BE} = 0.715 \text{ V}$. Calculate :

- (i) Voltage Gain (A_d)
(ii) Input Resistance (R_i)
(iii) Output Resistance (R_o)
- (b) Draw the circuit diagram of Practical Integrator along with frequency response and explain its operation. [6]

3. (a) Explain with a neat circuit diagram working of inverting Schmitt trigger using Op-Amp. Also give the equation for triggering points. [6]
- (b) With neat circuit diagram, explain current to voltage converter. [6]

Or

4. (a) Draw and explain square wave generator using Op-Amp and give expression for output frequency. [6]
- (b) An 8-bit DAC converter has a resolution of 10 m V/bit . Find the analog output voltage for the following digital input : [6]
- (1) 1000 1010
(2) 0001 0000

5. (a) With the help of neat block diagram explain operation of PLL. Define the term “lock range” and “Capture range”. [7]
- (b) Design a second order low pass filter with higher cut-off frequency of 2 kHz with pass gain is 1.5. Draw the designed circuit and sketch its frequency response. [6]
- $R_2 = R_3 = R$ and $C_2 = C_3 = C$
Assume $C = 0.01 \mu\text{f}$ and $R_1 = 10 \text{ k}\Omega$.
- Or*
6. (a) With the help of neat circuit diagram explain the operation of RC phase shift oscillator. [6]
- (b) Design a wide band pass filter for $f_L = 100 \text{ Hz}$, $f_H = 1 \text{ kHz}$ and pass band gain equal to 4. Also calculate the value of its quality factor ‘Q’. Assume : [7]
- $C' = 0.01 \mu\text{f}$ and $C = 0.05 \mu\text{f}$
 $R_1' = 10 \text{ k}\Omega$ and $R_1 = 10 \text{ k}\Omega$
7. (a) Calculate output frequency ‘ f_0 ’, Lock range ‘ Δf_L ’, Capture range ‘ Δf_C ’ of a PLL. If $R_T = 10 \text{ k}\Omega$, $C_T = 0.01 \mu\text{f}$, filter capacitor $C = 10 \mu\text{f}$ and Internal resistance = $3.6 \text{ k}\Omega$. Assume $\pm V = 10\text{V}$. [6]
- (b) Draw and explain wide band pass filter. Draw its frequency response. [7]

Or

8. (a) Draw neat circuit diagram of Voltage Controlled Oscillator (VCO) and derive expression for output frequency. [7]
- (b) Design an Active notch filter for rejecting the mains frequency of 50 Hz. Draw detailed design circuit diagram. Assume $C = 0.47 \mu\text{f}$. [6]

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