

Total No. of Questions—12]

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[4757]-146**S.E. (Electronics/Electronics & Telecommunication)****(Second Semester) EXAMINATION, 2015****INTEGRATED CIRCUITS AND APPLICATIONS****(2008 PATTERN)****Time : Three Hours****Maximum Marks : 100**

- N.B. :-**
- (i) Answer *three* questions from Section I and *three* questions from Section II.
 - (ii) Answers to the two Sections should be written in separate answer-books.
 - (iii) Neat diagrams must be drawn wherever necessary.
 - (iv) Figures to the right indicate full marks.
 - (v) Use of electronic pocket calculator is allowed.
 - (vi) Assume suitable data, if necessary.

SECTION I

1. (a) Derive the expression for A_d , R_i and R_o for dual input balanced output difference amplifier using r -parameters. Draw the small signal model for the same. [10]
- (b) With neat diagram explain the necessity and working of current mirror. [8]

P.T.O.

Or

2. (a) The following specifications are given for dual input balance output difference amplifier : [8]

$$R_C = 2.2 \text{ k}\Omega, R_E = 4.7 \text{ k}\Omega, R_{in_1} = R_{in_2} = 50 \text{ }\Omega,$$

$$+V_{CC} = 10 \text{ V}, -V_{EE} = -10 \text{ V}, \beta_{ac} = \beta_{dc} = 100,$$

$$V_{BE} = 0.715 \text{ V}.$$

Determine :

- (i) Operating point i.e. I_{CQ} and V_{CEQ}
 - (ii) Voltage gain
 - (iii) Input resistance
 - (iv) Output resistance.
- (b) State the values for all ideal parameters of Op-amp. [5]
- (c) State different Op-amp technologies and compare them. [5]

3. (a) Define and explain the following terms with respect to Op-amp : CMRR, PSRR, Slew rate, Gain bandwidth product. [8]
- (b) What is the need of frequency compensation ? State and explain any *one* method of external frequency compensation. [8]

Or

4. (a) What are the different types of noise that are associated with Op-amps ? Draw Op-amp noise model and give expression for output noise voltage. [8]

- (b) Explain the effect of temperature on : [8]
- (i) Input bias current
 - (ii) Input offset current
 - (iii) Input offset voltage
 - (iv) Output offset voltage.
5. (a) What are problems associated with the ideal integrator ? Draw neat circuit diagram of practical integrator and explain its operation with its frequency response. [8]
- (b) Draw and explain different amplifiers using Op-Amp and obtain the expression for output voltage. [8]

Or

6. (a) Design a practical differentiator having unity gain at 150 Hz. [8]
- (b) Draw a neat diagram of inverting summing amplifier with three inputs and obtain the expression for output voltage. [8]

SECTION II

7. (a) Draw and explain sample and hold circuit using Op-amp. [4]
- (b) Draw and explain three Op-amp instrumentation amplifier. Derive the expression for its output voltage. [10]
- (c) Explain the zero crossing detector using Op-amp with necessary waveform. [4]

Or

8. (a) Explain the necessity of precision rectifier with neat circuit diagram. Explain the operation of full wave precision rectifier. [10]
- (b) Explain the working of inverting Schmitt trigger. Also derive the equation for the trigger points. [8]
9. (a) State the specifications of ADC. Also explain the applications of ADC. [8]
- (b) Draw neat diagram and V to F convertor and explain its operations. [8]

Or

10. (a) Calculate output voltage of 8-bit DAC for digital input 10000000 and 11011101 with reference voltage of 10 V. [8]
- (b) With the help of neat diagram explain the operation of Dual Slope ADC. [8]
11. (a) State advantages of active filter. Explain the operation of first order low pass filter with the help of circuit diagram. [8]
- (b) Write short notes on : [8]
- (i) Frequency synthesizer using PLL
- (ii) FM demodulator using PLL.

Or

12. (a) Write short notes on : [8]
- (i) Op-amp based audio amplifier circuit
 - (ii) Active tone control circuit.
- (b) With the help of neat block diagram explain operation of PLL.
Define the terms Lock range and Capture range. [8]

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