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S.E. (Instrumentation & Control) (I Sem.) EXAMINATION, 2010

LINEAR INTEGRATED CIRCUITS—I

(2008 COURSE)

Time : Three Hours

Maximum Marks : 100

- N.B. :—
- (i) Answers to the two sections should be written in separate answer-books.
  - (ii) Neat diagrams must be drawn wherever necessary.
  - (iii) Figures to the right indicate full marks.
  - (iv) Your answers will be valued as a whole.
  - (v) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
  - (vi) Assume suitable data, if necessary.

SECTION I

1. (a) Enlist any *five* dc characteristics and any *three* ac characteristics of operational amplifier. [8]
  - (b) Select any *four* characteristics and mention their ideal and practical values. [8]
- Or
2. (a) Write absolute maximum ratings of IC741 : [8]
    - (i) Supply voltage
    - (ii) Power dissipation
    - (iii) Differential input voltage
    - (iv) Input voltage range.

P.T.O.

(b) Draw equivalent circuit of operational amplifier. What is important difference between IC OP-07 and IC 741 and IC-324 ? [8]

3. (a) Draw the circuit diagram of voltage series feedback and voltage shunt feedback circuit. Compare them. [8]

(b) Analyze voltage shunt feedback circuit for closed loop gain equation. [8]

Or

4. (a) How negative feedback increases input resistance of op-amp? Explain in case of non-inverting amplifier. [8]

(b) Write a short note on voltage follower. [8]

5. (a) Analyze summing amplifier (inverting) with three inputs  $V_1$ ,  $V_2$ ,  $V_3$  and obtain closed loop gain equation. [10]

(b) Design a circuit that follows given equation : [8]

$$y = mx + c$$

where  $y$  = output voltage

$m$  = slope = 2.5

$x$  = input voltage

$c$  = reference voltage (0.5 V)

Or

6. (a) Analyze first order active differentiator circuit using op-amp. Derive the equation for cut-off frequency. [10]  
(b) Write a short note on integrator using op-amp. [8]

## SECTION II

7. (a) List important comparator characteristics. Explain their importance. How are comparators used in practice ? [10]  
(b) Write a short note on ZCD and its use. [8]

Or

8. (a) Explain operation of Wien bridge and RC phase shift oscillator. [10]  
(b) How a precision full wave rectifier works ? Explain with wave forms. [8]

9. (a) In a 555 monostable circuit : [8]

$$V_{CC} = 12 \text{ V}$$

$$R = 33 \text{ k}\Omega$$

$$C = 0.47 \text{ }\mu\text{F}$$

What is the minimum trigger-voltage that will produce an output pulse ? What is maximum capacitor voltage ? What is width of the output pulse ?

(b) Design a 555 astable circuit, for given data : [8]

Output frequency = 40 kHz

$V_{CC} = 9 \text{ V}$

Timing capacitor = 0.001  $\mu\text{F}$

Or

10. (a) What are requirements of a good voltage regulator ? What is line and load regulation ? Explain. [8]

(b) How to generate +5 V using IC 7805 ? Explain the design. [8]

11. (a) Compare active and passive filter. [8]

(b) Draw the response of Butterworth, Chebyshev and Bessel Filter (Low pass). [8]

12. (a) Compare step response of Butterworth, Chebyshev and Bessel low pass filter. [8]

(b) Design an active first order low pass filter of cut-off frequency 10 kHz. Assume voltage gain of 1.58. Assume capacitor value as 0.01  $\mu\text{F}$ . [8]