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Question Paper Code : X 20446

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2020
Fourth Semester
Electronics and Communication Engineering
EC 6404 – LINEAR INTEGRATED CIRCUITS
(Common to Medical Electronics Engineering/Robotics and Automation Engineering)
(Regulations 2013)
(Also Common to PTEC 6404 – Linear Integrated Circuits for B.E. (Part – Time)
Third Semester – Electronics and Communication Engineering –
Regulations 2014)

Time : Three Hours Maximum : 100 Marks

Answer ALL questions

PART – A **(10×2=20 Marks)**

1. Under what conditions is an operational amplifier said to be an ideal operational amplifier.

2. Define slew rate.

3. State the advantages of using a Schmitt trigger in an electric circuit.

4. Given a bandpass filter with resonant frequency 1200 Hz and bandwidth of 2400 Hz, find its higher cut-off frequency.

5. Mention the various applications of PLL.

6. Why is capture-range always smaller than lock-range ?

7. In what way is the R-2R Ladder type D/A converter better than a weighted resistor type converter ? Do and justify based on their applicability.

8. How are over-sampling A/D converters employed for real-time applications ?

9. State the reason for connecting a capacitor at the input and the output side of an IC voltage regulator.

10. Draw the circuit diagram of an opto-coupler.

PART – B **(5×13=65 Marks)**

11. a) With suitable diagram, explain the AC performance open-loop gain characteristics of an operational amplifier. **(13)**

(OR)

b) Briefly describe the operating principle of BJT differential amplifier with active load along with a neat sketch. **(13)**

12. a) i) Design a second and a fourth order low-pass Butterworth filters with a cut off frequency of 10 kHz and unity gain at low frequency. Determine the magnitude of the voltage transfer function in dB at 12 kHz for these filters. **(8)**

ii) Design a differentiator using Op-amp to differentiate an input signal with f_{max} = 120 kHz and also draw the output waveform for a sine-wave and square-wave input of 3 V peak at 240 Hz. **(5)**

(OR)

b) i) Discuss any two applications of operational amplifier as non-linear circuit. **(6)**

ii) With neat diagram explain the principle of operation of an instrumentation amplifier. List the various applications of instrumentation amplifier. **(7)**

13. a) i) With neat diagram, explain the operation of variable trans-conductance amplifier with floating and grounded load model. **(5)**

ii) For PLL 565, given the free-running frequency as 110 kHz, the demodulation capacitor of 4 μF and supply voltage is ±9 V, determine the lock and capture frequencies and identify the component values. **(8)**

(OR)

b) i) Derive the expression for capture range of Phase Locked Loop. **(8)**

ii) Explain the application of PLL as frequency synthesizer. **(5)**

14. a) i) Explain in detail about R-2R ladder type D/A Converter. **(7)**

ii) With neat diagram, explain the operating principle and characteristics of dual slope A/D converter. **(6)**

(OR)

b) i) Explain the flash type Analog/Digital converter. **(6)**

ii) Explain the operation of a Sample-and-Hold circuit with a suitable block diagram. List the various factors that contribute to hold mode droop in this circuit. **(7)**

15. a) i) Explain in detail on the short circuit protection provided in IC 723 Voltage Regulator. **(5)**

ii) Discuss the fundamental operating concept of video amplifiers and isolation amplifiers. **(8)**

(OR)

b) i) Design an astable multivibrator using 555 timer for a frequency of 1.26 kHz and duty cycles of 55% and 72%. Assume C = 0.18 μF. **(8)**

ii) Draw the operational circuit of IC 555 timer and mention its various applications. **(5)**

PART – C **(1×15=15 Marks)**

16. a) With necessary diagrams, explain the following applications of operational amplifier.

i) Subtractor

ii) Comparator

iii) Clamper

iv) Anti-logarithmic amplifier

v) Peak detector. **(15)**

(OR)

b) Discuss in detail on the following waveform generators :

i) ICL 8038 function generator

ii) Sine-wave generators

iii) Triangular wave generator. **(15)**