



WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 4th Semester Examination, 2020

ELSACOR08T-ELECTRONICS (CC8)

Time Allotted: 2 Hours

Full Marks: 40

*The figures in the margin indicate full marks.
Candidates should answer in their own words and adhere to the word limit as practicable.
All symbols are of usual significance.*

GROUP-A

Answer any five questions from the following

2×5 = 10

1. Write down characteristics of *practical* Op-Amp.
2. Draw a circuit diagram of Op-Amp based inverting (or non-inverting) amplifier. Label your circuit whether it is inverting or non-inverting amplifier. Display the expression of close-loop gain of your circuit in your drawing.
3. Why we need to nullify the offsets of Op-Amp in real applications?
4. What are the differences of 'virtual ground' with ordinary ground?
5. Draw the transfer characteristics of a phase detector.
6. Draw a circuit diagram for a dual power supply of output voltage rating $-12V$ -0 $+12V$ ($\pm 12V$). You may use IC78XX series, IC79XX series or both. Assume, a 20V dc power supply as source of supply.
7. Op-Amp based oscillators perform better than transistor-based oscillators. Why?
8. The voltage gain of a circuit is 40 dB. What is ratio of output voltage to the input voltage?
9. How the order of a filter influences its filter characteristics?

GROUP-B

Answer any two questions from the following

15×2 = 30

- 10.(a) What are sources of Offset output voltage in practical Op-Amp? 2
- (b) How slew rate limits the performance of Op-Amp? 4
- (c) With respect to Op-Amp, explain "small signal bandwidth is limited by unity-gain-frequency while large signal bandwidth is limited by slew rate". 4

- (d) A typical Op-Amp is specified to have a slew rate of $0.314 \text{ V}/\mu\text{s}$. If the Op-Amp is used as an amplifier with expected peak output voltage of 10V , determine the highest sinusoidal frequency that would get satisfactorily amplified. 5
- 11.(a) Draw frequency response of typical practical Op-Amp and show the effect of negative feedback on such response. 2
- (b) Why Op-Amp based circuit such as comparator, Schmitt Trigger are treated as non-linear applications of Op-Amp while, circuits such integrators, amplifiers are treated as linear applications of Op-Amp? 2
- (c) With circuit diagram, explain the operation of Schmitt Trigger. 5
- (d) With circuit diagram, explain the operation of Op-Amp based integrator. How to impose initial condition into integrator circuit? 5+1
- 12.(a) In general, rectangular waveform with amplitude 0 to 5 V is obtained at the output of the IC555. Why IC555 is made so? 2
- (b) What is duty cycle of a rectangular waveform? 1
- (c) What do you mean by monostable multivibrator? With the circuit diagram explain the operation of monostable multivibrator. 1+5
- (d) What do you mean by astable multivibrator? With the circuit diagram explain the operation of astable multivibrator. 1+5
- 13.(a) Explain the operation of sample and hold system. 5
- (b) Construct a circuit for first order low-pass Butterworth filter. Explain its operation. From the mathematical expression of the gain of the circuit, at cut-off frequency show that the gain becomes $\frac{1}{\sqrt{2}}$ times the pass-band gain (or falls by 3 dB). Also, show that the beyond the cut-off frequency, the roll-off rate of gain is 20 dB/decade. 2+3+3+2

N.B. : *Students have to complete submission of their Answer Scripts through E-mail / Whatsapp to their own respective colleges on the same day / date of examination within 1 hour after end of exam. University / College authorities will not be held responsible for wrong submission (at in proper address). Students are strongly advised not to submit multiple copies of the same answer script.*

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