

2022

ELECTRONICS — HONOURS

Paper : CC-8

(Operational Amplifiers and Applications)

Full Marks : 50

*The figures in the margin indicate full marks.**Candidates are required to give their answers in their own words as far as practicable.*

Answer question no. 1 and any four questions from the rest.

1×10

1. Answer any ten questions from the following :

- (a) The inputs of an OPAMP in practice are the _____ of two different transistors.
- | | |
|------------------|--------------|
| (i) Emitters | (ii) Bases |
| (iii) Collectors | (iv) Drains. |
- (b) OPAMP performs _____ operations.
- | | |
|--------------------|-------------------------|
| (i) Arithmetic | (ii) Logical |
| (iii) Alphanumeric | (iv) Both (i) and (ii). |
- (c) Among SSI, MSI, LSI and VLSI
- | |
|---|
| (i) SSI indicates the smallest quantity and LSI indicates the largest quantity |
| (ii) MSI indicates the smallest quantity and VLSI indicates the largest quantity |
| (iii) LSI indicates the smallest quantity and MSI indicates the largest quantity |
| (iv) SSI indicates the smallest quantity and VLSI indicates the largest quantity. |
- (d) A certain inverting OPAMP has R_i and $1\text{ k}\Omega$ and R_f of $100\text{ k}\Omega$. The closed-loop voltage gain is
- | | |
|-----------|------------|
| (i) - 101 | (ii) - 100 |
| (iii) 101 | (iv) 100. |
- (e) The 'virtual short' concept has evolved from which ideal characteristics of OPAMP?
- | | |
|---------------------------|-------------------------------|
| (i) Infinite voltage gain | (ii) Infinite input impedance |
| (iii) Infinite bandwidth | (iv) None of these. |
- (f) The value of input capacitance of OPAMP is of the order of
- | | |
|------------------|---------------------|
| (i) Farad | (ii) milli Farad |
| (iii) pico Farad | (iv) None of these. |

Please Turn Over

- (g) As the order of the filter increases then the cut-off frequency _____.
- (i) Increases (ii) Decreases
(iii) Remains the same (iv) None of these.
- (h) The notch filter is a
- (i) High pass filter (ii) Low pass filter
(iii) Band pass filter (iv) Band stop filter.
- (i) The output waveform of an astable multivibrator is
- (i) Square wave (ii) Triangular wave
(iii) Saw tooth wave (iv) Delta function.
- (j) A square wave can be converted to a triangular wave using
- (i) Adder (ii) Differentiator
(iii) Integrator (iv) None of these.
- (k) Unit of slew rate is
- (i) mA/s (ii) V/ μ s
(iii) Ohm/m (iv) Watt/s.
- (l) An inverting OPAMP has voltage gain of 100. The input voltage is 10 V. The output voltage will be
- (i) 1000 (ii) 10
(iii) will be saturated at the level of bias voltage
(iv) None of these.
2. (a) Characteristically, the ideal OPAMP has infinite input resistance and zero output resistance. Mention the advantages of having these characteristics.
(b) Ideal OPAMP has infinite voltage gain. Can it be realised practically?
(c) Why OPAMP is regarded as a differential amplifier?
(d) Draw the block diagram of OPAMP. (2+2)+2+2+2
3. (a) What are meant by input offset voltage and input bias current?
(b) Define CMRR. What should be the ideal value? Why?
(c) What is the voltage gain of the OPAMP buffer? (2+2)+(2+1+2)+1
4. (a) Draw the circuit diagram of the open-loop differential amplifier.
(b) Draw the required circuit and derive the expression of the output voltage for the below-mentioned OPAMP configurations ;
- (i) Multiplier
(ii) Integrator. 2+(5+3)

(3)

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5. Explain the operation of an op-amp first order high-pass filter with the help of a neat schematic diagram. Calculate the cut-off frequency. 4+4+2
6. (a) Draw the circuit of a square wave generator and explain its operation.
(b) Draw the circuit of the op-amp based Wien bridge oscillator and explain its operation. (2+3)+(2+3)
7. (a) What is Phase-Lock Loop? Draw the block diagram. Why is it used?
(b) Explain the operating principle of the XOR type phase detector.
(c) Draw the circuit diagram of VCO using IC 566. (2+2+1)+2+3
8. (a) What is the use of IC LM317? Draw the pin diagram.
(b) Draw the block diagram representation of the SMPS module.
(c) What are meant by 'cutoff-frequency' and 'roll-off' concerning filter? (2+1)+3+(2+2)
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