M.Sc. 1st Semester Examination, 2015

ELECTRONICS

(Electronic Circuit Lab)

(Practical)

PAPER — ELC-106

Full Marks : 50

Time : 3 hours

Answer any one question, selecting it by a lucky draw

The figures in the right-hand margin indicate marks

(Turn Over)
SET – I

1. Use LM 317 to design a regulated power supply with following specification

   Output Voltage:

   Output Current:

   [Specification may be provided in the lab during examination]

   (a) Working formula. 4

   (b) Circuit diagram and labelling. 3

   (c) Implementation of circuit on breadboard. 3

   (d) Record data for load, regulation and line regulation. 5 + 5

   (e) Draw necessary graphs. 4 + 4

   (f) Calculate percentage if regulation and stability factor. 2 + 2

   (g) Discuss on the results obtained. 3
2. Design and study of the performance of a active butter worth low pass filter of the kind of 1st order. Use OPAMP as active element. Specifications:

Cut off frequency . . . . .
Pass band gain . . . . .

[Specifications may be provided in the laboratory during examination.]

Distribution of Marks:

(a) Design with working formula. 6 + 2
(b) Draw the circuit and label. 3
(c) Implement the circuit on breadboard. 3 + 1
(d) Record the data for freq. response. 8
(e) Draw the graphs. 3
(f) Compare the cut-off frequency and roll-off rate for theoretical and experiment value. \( \left( 3\frac{1}{2} + 3\frac{1}{2} \right) \)
(g) Discuss on the results obtained. 2
3. Use 78xx series of IC regulator to design a regulated power supply (fixed) with the following specifications:

   Output Voltage: \( \ldots \) V

   Output Current: \( \ldots \) mA

[Exact specifications may be provided in the Laboratory]

(a) Design with working formula.

(b) Draw the circuit diagram and label it.

(c) Implement the circuit on breadboard.

(d) Record the data for load and line regulation characteristics.

(e) Draw the graphs.

(f) Calculate percentage of regulation and stability factor.

(g) Discuss on the results obtained.
4. Use the OPAMP as an antilogarithmic amplifier and study its performance.

(a) Working principle for design considerations. 4
(b) Draw the circuit diagram and label it. 3
(c) Implement the circuit on the breadboard. 3
(d) Record the output data for variation of input voltage in small steps. 10
(e) Draw the graphs. 4 + 4
(f) Discuss and comment on the possible application of the circuit. 7
5. Design and study the performance of a regulated power supply. Use power transistor and OP-AMP for design. With following specifications:

   Output Voltage: \( \ldots \ldots \) V,
   Output Current: \( \ldots \ldots \) mA

(a) Design consideration with necessary working formula.

(b) Draw circuit diagram and label it.

(c) Implement the circuit on breadboard.

(d) Record data for load and line regulations. \( 4 + 4 \)

(e) Draw the necessary graphs. \( 3 + 3 \)

(f) Calculate percentage of regulation and stability factor. \( 2 + 2 \)

(g) Discuss on the results obtained. \( 2 \)
6. Design a single stage CE amplifier. Couple the single stage with second stage using Resistance and Capacitance and study its performance.

(a) Design consideration with working formula. 4 + 4
(b) Circuit diagram and labelling. 3
(c) Implement the circuit on breadboard. 4
(d) Record the data for frequency response characteristics. 10
(e) Draw graphs. 4
(f) Calculate the Bandwidth. 3
(g) Discuss the results obtained. 3
7. Design and study the performance regulated power supply using power transistor as pass element and a transistor as a comparator with following specifications.

Output Voltage: ... V
Output Current: ..... mA.

(a) Working formula with design consideration.  8
(b) Circuit diagram and labelling. 3
(c) Circuit implementation on breadboard. 4
(d) Recording of data for load and line regulations. 4 + 4
(e) Draw graphs. 3 + 3
(f) Calculate percentage of regulation and stability factor. 2 + 2
(g) Discuss the results obtained. 2
8. Design a high pass Butterworth filter using active element with following specifications.

   Cut off frequency: ....
   Gain: .......

Study its performance.

(a) Working formula with design consideration.  9
(b) Circuit diagram and labelling.  3
(c) Implement the circuit on breadboard.  3
(d) Record of data of frequency response.  8
(e) Draw graphs.  4
(f) Compare cut-off freq. and roll-off rate between calculated value and experimental value.  3 + 3

(g) Discuss the results obtained.  2
9. Use OPAMP as logarithmic amplifier.
   
   (a) Design consideration and working principle. 4
   
   (b) Draw the circuit diagram and label it. 3
   
   (c) Implement the circuit on breadboard. 3
   
   (d) Record the output data for variation of input voltage in small steps. 10
   
   (e) Draw the graphs. 4 + 4
   
   (f) Discuss and comment on the possible application of the circuit. 7
10. Design an active low pass first order Butterworth filter with following specifications and study its performance.

Cut off frequency: ....
Gain: ....

(a) Design consideration with working formula. 9
(b) Draw the circuit and label. 3
(c) Implement the circuit on bread board. 3
(d) Record data for frequency response characteristics. 8
(e) Draw graphs. 4
(f) Compare between calculated value and experimental value of cut-off freq. and roll-off rate. 3 + 3
(g) Discuss the results obtained. 2.
11. Design a single stage CE amplifier with following specifications and study its performance.

Gain: ........

(a) Design consideration and working formula. 8

(b) Draw circuit diagram and label it and implementation of the circuit on bread-board. 3 + 3

(c) Record data for frequency chart. 8 + 2

(d) Draw graphs. 4

(e) Calculate Bandwidth. 4

(f) Discuss the results obtained. 3
12. Design an active high pass first order Butterworth filter with following specifications and study its performance

Cut off frequency: ...
Gain: ...

(a) Design consideration with working formula. 8
(b) Circuit diagram with labelling. 3
(c) Implementation of the circuit. 3
(d) Record of data for frequency response characteristics. 8
(e) Draw graphs. 4
(f) Compare theoretical value and experimental value of cut-off frequency and roll-off rate. \( \left( \frac{3^{\frac{1}{2}} + 3^{\frac{1}{2}}}{2} \right) \)
(g) Discuss the results obtained. 2

Distribution of Marks:

Experiment : 35 Marks
Viva-voce : 10 Marks
Laboratory Note Book : 05 Marks
Total : 50 Marks
SET – II

1. Design a regulated power supply using a power transistor as a pass element and an OP-AMP as comparator.

   Output Voltage: \( \ldots \) V,
   Output Current: \( \ldots \) mA.

(a) Working formula. 4
(b) Circuit diagram with labelling. 3
(c) Design consideration and components to be used. 4
(d) Circuit implementation on bread board. 4
(e) Recording of data for load and line regulation. \(4 + 4\)
(f) Draw the graphs. \(3 + 3\)
(g) Calculation of percentage regulation and stability factor. \(2 + 2\)
(h) Discuss of the results obtained. 2
2. Design a second order active low pass Butterworth filter and study its performance.

(a) Working formula. 4

(b) Circuit diagram with labelling. 3

(c) Design consideration for cut-off frequency = . . kHz. 5

(d) Implementation of the circuit on bread board. 3

(e) Recording of data for frequency response characteristics. 8

(f) Drawing of graphs. 4

(g) Finding and comparison of the cut-off frequency and roll-off rate with the known values. \((2 +1) + (2 +1)\)

(h) Discuss of the results obtained. 2
3. Design a regulated power supply using a power transistor as a pass element and another transistor as a comparator:

   Output Voltage: \ldots \text{V},
   Output Current: \ldots \text{mA}.

   (a) Working formula.
   (b) Circuit diagram with labelling.
   (c) Design consideration and components to be used.
   (d) Circuit implementation on bread board.
   (e) Recording of data for load and line regulation characteristics.
   (f) Drawing of graphs.
   (g) Calculation of percentage regulation and stability factor.
   (h) Discussion of the results obtained.
4. Design a regulated power supply using 78XX group of IC regulator and study its performance:

   Output Voltage: ... V,
   Output Current: ... mA:

(a) Working formula. 4
(b) Drawing of circuit diagram with labelling. 3
(c) Circuit implementation on bread board. 3
(d) Recording of data for getting the characteristics of load and line regulation. 5 + 5
(e) Drawing of graphs. 4 + 4
(f) Calculation of percentage regulation and stability factor. 2 + 2
(g) Discussion of the results obtained. 3
5. Design a second order active high pass Butterworth filter and study its performance:

(a) Working formula.  

(b) Circuit diagram with labelling.  

(c) Design consideration for cut-off frequency .. kHz.  

(d) Implementation of the circuit on bread board.  

(e) Recording of data for frequency response characteristics.  

(f) Drawing of graphs.  

(g) Finding and comparison of the cut-off frequency and roll-off rate with the known values.  

(h) Discuss of the results obtained.
6. Study the performance of an antilogarithmic amplifier using OP-AMP.

(a) Working formula. 4

(b) Drawing of circuit diagram with labelling. 3

(c) Circuit implementation on breadboard. 3

(d) Recording of data by varying the input voltage at small steps. 10

(e) Drawing the graphs. 4 + 4

(f) Discussion about the nature of curves and the results obtained. 3

(g) Comment on possible application of the circuit. 4
7. Design an active high pass Butterworth filter at a cut-off frequency of 3 kHz and pass band gain of 2 using only one R-C section and study its performance:

(a) Working formula.  

(b) Circuit diagram with labelling.  

(c) Design consideration and components to be used.  

(d) Implementation of the circuit.  

(e) Recording of data for frequency response characteristics.  

(f) Drawing of graphs.  

(g) Finding and comparison of the cut-off frequency and roll-off rate with the given values. \[ \left(2 + \frac{1}{2}\right) + \left(2 + \frac{1}{2}\right) \]

(h) Discussions of the results obtained.  

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(Turn Over)
8. Study the performance of a logarithmic amplifier using OP-AMP.

(a) Working formula. 4

(b) Circuit diagram with labelling. 3

(c) Implementation of the circuit on breadboard. 3

(d) Recording of data by varying the input voltage at small steps. 10

(e) Drawing of graphs. 4 + 4

(f) Discuss the nature of graphs obtained and also the results. 3

(g) Comment on possible application of the circuit using the results obtained. 4
9. Design a R-C coupled amplifier using transistors and study its performance:

(a) Working formula. 4

(b) Circuit diagram with labelling. 3

(c) Design consideration for gain = . . . 5

(d) Implementation of the circuit on breadboard. 3

(e) Recording of data for frequency response characteristics. 10

(f) Drawing of graphs. 4

(g) Calculation of bandwidth. 3

(h) Discussion of the results obtained. 3
10. Design an active low pass Butterworth filter with a roll-off rate 20 dB/decads having cut-off frequency 2 kHz and pass band gain of 2. Study its performance:

(a) Working formula. 4

(b) Circuit diagram with labelling. 3

(c) Design consideration and components to be used. 4

(d) Implementation of the circuit on breadboard. 3

(e) Recording of data for frequency response characteristics. 8

(f) Drawing of graphs. 4

(g) Finding and comparison of cut-off frequency and roll-off rate with the supplied values. \( \left( 2 + \frac{1}{2} \right) + \left( 2 + \frac{1}{2} \right) \)

(h) Discussions of the results obtained. 2
11. Design a regulated power supply of variable output using LM 317, output voltage = 5 V to 7.5 V and output current = 100 mA.

(a) Working formula. 4
(b) Circuit diagram with labelling. 3
(c) Circuit implementation on breadboard. 3
(d) Recording of data for load and line regulation. 5 + 5
(e) Drawing of graphs. 4 + 4
(f) Calculation of % regulation and stability factor. 2 + 2
(g) Discussion on the results obtained. 3

**Distribution of Marks:**

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<tr>
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<th>Marks</th>
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<tbody>
<tr>
<td>Laboratory Note Book</td>
<td>05</td>
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<tr>
<td>Viva-voce</td>
<td>10</td>
</tr>
<tr>
<td>Experiment</td>
<td>35</td>
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<tr>
<td><strong>Total</strong></td>
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