

Part	Content	Points		
1.1.1	RC – circuit. Theory	6		
	Amplitude ratio formula			3
	Phase shift formula			3
1.1.2	Experimental data	8		
	Amplitude ratio vs. frequency dependence 7 or more points (5-6, less); Frequency range to 500 Hz, (to 300 Hz, less);			2(1;0) 2(1;0)
	Phase shift vs. frequency dependence 7 or more points (5-6, less); Frequency range to 500 Hz, (to 300 Hz, less);			2(1;0) 2(1;0)
1.1.3	Linearization & Graphs	8		
	Amplitude ratio vs. frequency dependence: Linearization formula; Graph (<i>only if exp. data is obtained</i>): - axis label & scale; - points according to data table; - line;			2 0,25 0,25 0,50
	Phase shift vs. frequency dependence: Linearization formula; Graph (<i>only if exp. data is obtained</i>): - axis label & scale; - points according to data table; - line;			2 0,25 0,25 0,50
	Answer for RC: Answer in range 0,8 – 1,2 ms (0,5 – 1,5 ms, иное)			2(1; 0)
1.1.4	Reason for RC difference: - oscilloscope; - Input impedance (1 MOhm); - LCR-meter	7		3 3 1
1.1.5	Theoretical calculations for parallel RC circuit: - formula $Z(f)$; - schematic graph (max at zero, monotonic decrease); - value at $f \rightarrow 0$; - value at $f \rightarrow \infty$;	7		3 1+1 1 1
1.2.1	LC resonant circuit (theory)	5		
	Formula for Z			2
	Formula for resonant frequency			1
	Schematic graph (vertical asymptotes, zero values at 0 & infinity)			2
1.2.2	Schematic graph (maximum value < infinity, zero values at 0 & infinity)	4		2+2
1.2.3	LC resonant circuit (experiment)	7		
	12 or more points (9-11;less); Frequency range is 4 times bigger than peak width; Dependence has maximum;			2(1;0) 1 1
	Graph (<i>only if exp. data is obtained</i>): - axis label & scale; - points according to data table; - line;			1 1 1

1.2.4	Resonant frequency: Measured C is in range 200-250 pF (150-300, other); Measured L is in range 270-320 μ H (240-350, other) Resonant frequency value (calculated from LC); Resonant frequency value (from graph); Equivalence of frequencies: No (Yes)	5	1(0,5;0) 1(0,5;0) 1 1 1 (0)	
1.2.5	Resonant frequency vs. capacitance dependence: - 7 or more (5-6; less) - capacitance in range 30-250 pF (20-300, other); - linearization; Linearized plot (<i>only if exp. data is obtained</i>): - axis label & scale; - points according to data table; - line; Line shift: - Shift is in right direction; - Shift range is 60-100 pF (40-120, other); - Shift reason –oscilloscope;	16	2(1;0) 2(1;0) 3 1 1 1 1 2(1;0) 3	
1.2.6	LCR -meter working frequency: - measured by oscilloscope; - value in range 850-930 Hz;	4	2 2	
1.3.1	Diod voltage-current dependence Schematic graph channel 1 (sinus); Schematic graph channel 2 («cutted» sinus); Schematic graph of voltage-current dependence Saturation current value (range 2-5 μ A)	10	 2 2 3 3	
1.3.2	Schematic graph at high frequency (good rectifying) Schematic graph at low frequency (voltage pulses)	4	2 2	
1.3.3	Additional capacitor decreased rectifying frequency Output voltage vs. Input voltage dependence: -7 or more (5-6; less); - input voltage range 20 V or more (10 V; less); - dependence is linear; Graph: (<i>only if exp. data is obtained</i>): - axis label & scale; - points according to data table; - line; Slope value.	10	1 2 1 1 1 1 1 2	

1.3.4	Simple amplifier	14	
	Resistance range 370-500 Ohm		4
	Output voltage vs. input voltage dependence: - 12 points or more (9-11, other); - input voltage range 1 V (0,5 V, less); - increasing dependence with saturation; Graph: (only if exp. data is obtained): - axis label & scale; - points according to data table; - line; Linear region. Amplifier gain value; Opening voltage of non-linear regime		2(1;0) 1(0,5;0) 1 1 1 1 1 1 1
1.3.5	Resonant amplifier	5	
	Frequency of maximum gain 500-1000 kHz		2
	Phase shift 180°		3
1.3.6	Gain	9	
	Output voltage vs. input voltage dependence: - 12 points or more (9-11, other); - input voltage range 1 V (0,5 V, less); - increasing dependence with saturation; Graph: (only if exp. data is obtained): - axis label & scale; - points according to data table; - line; Linear region. Amplifier gain value;		2(1;0) 1(0,5;0) 1 1 1 1 1 1
1.3.7	High-frequency generator	3	
	Number of turns 10-15		3
1.3.8	Dependency measurements: - 12 points or more (9-11, less); - input voltage range 5 V (2,5 V; less); - Decreasing convex dependence; Breakdown voltage in range 3-4 V Graph (only if exp. data is obtained): - axis label & scale; - points according to data table; - line;	8	2(1;0) 1(0,5;0) 1 1 1 1 1
1.3.9	Modulator	4	
	Schematic graph for Source signal		2
	Schematic graph for Gate signal		2
1.4.1	Capacitor choice	3	
	Capacitance value 0,02 uF		3

1.4.2	Разделитель с диодом	6		
	Schematic graph: input signal		2	
	Schematic graph: output signal		2	
	No dependence		2	
1.4.3	Improved detector	10		
	Experimental data: - 7 points or more (5-6, less); - input voltage range 20 V or more (10 V; less); - linear dependence obtained;		2(1;0) 1(0,5;0) 1	
	Graph (<i>only if exp. data is obtained</i>): - axis label & scale;		1	
	- points according to data table;		1	
	- line;		1	
	Slope value;		2	
	Ratio of slopes		1	
2.1.2	Gain in range 3-5 (2-6, other)	2	2(1;0)	
2.1.4	Multistage amplifier	5		
	Overall gain		2	
	Gain (multiplication)		2	
	Second stage gain		1	
2.1.5		4		
	Schematic graph 1kHz (sinus)		2	
	Schematic graph 5 kHz (distorted sinus)		2	
2.1.6	Low frequency amplifier	5		
	Headphone resistance 16-20 Ohm		1	
	Schematic graph without capacitor		1	
	Schematic graph with capacitor		1	
	Impedance modulus at 1 kHz (16-20 Ohm)		1	
	Impedance module at 500 Hz (1,5-4,5 Ohm)		1	
2.2.1	Decrease inductance by removing magnetic core	4	4	
2.2.2	Detected signal	8		
	Carrier frequency 2,3-2,6 MHz		4	
	Modulation frequency 860-900 Hz		4	
2.2.3	Radio message	9		
	Morse signal		4	
	Message (Moscow)		5	
	Total	200		