SCS2213 - ELECTRONICS AND PHYSICAL COMPUTING

ONLINE PRACTICAL TEST 1

ANALOG ELECTRONICS

Duration: 1 ½ hour **Index no:**

Answer the following questions and attach the required screenshots. Upload a file in pdf format with your index number.

Analyze the scenario below and answer the questions by designing the circuit using EWB.

1. Write down the values of the following parameters regarding the main supply voltage in Sri Lanka.
    a. Waveform/ signal type: AC
    b. RMS voltage: 230V
    c. Frequency: 50H_Z

2. In EWB, set an AC voltage source with the relevant parameters mentioned above.

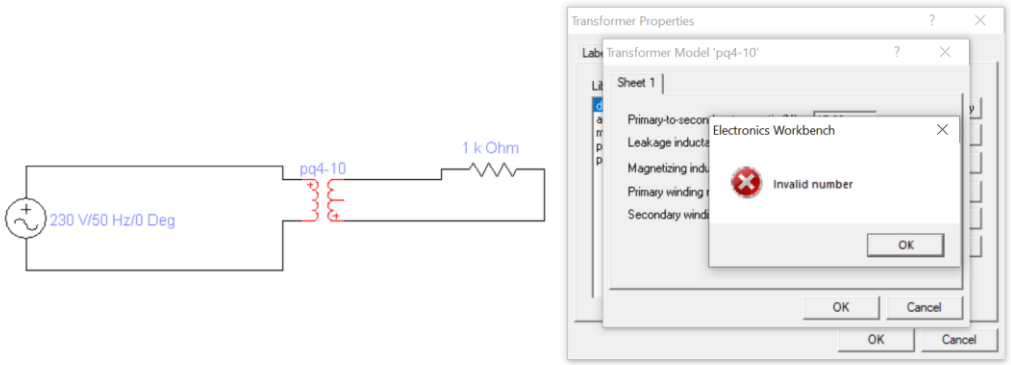
3. If you want to convert that voltage mentioned in 1. b) to 15 Vrms, what type of transformer that needs to be used?

    Answer: Step down transformer

4. What is the ratio between primary and secondary winding?

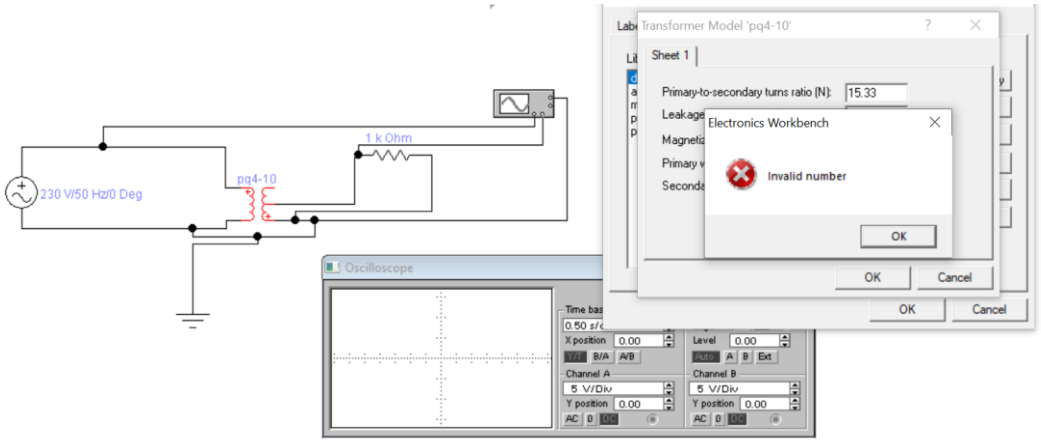
    Answer: 46:3

5. In EWB, connect a transformer to the previously set AC voltage source. Change the primary to secondary turn's ratio (N) to the required value in transformer properties. Complete the output side connecting a load resistor.



6. Using oscilloscope, find the maximum peak voltage reading **with error**.
($Vrms = \frac{Vpeak}{\sqrt{2}}$)
Attach the screenshot of the oscilloscope output.

Answer:



7. If you want to convert this secondary voltage from AC to DC, what kind of electronic component that can be used?

Answer: Diode (Rectifier)

8. Complete the circuit using the component mentioned in question. Attach a screenshot of the circuit.

9. Simulate the completed circuit and obtain the output and input signal patterns. (Set two different wire colors to the two channels of oscilloscope for a clear visualization of input and output waveforms)

Attach a screenshot of the oscilloscope output.

10. What is the electronic component that can be used in order to get a smooth DC output of the above circuit?

    Answer: Capacitor

11. Suggest a commercially using electronic component mentioned in question 10 by its generally used values (type, value and working voltage)

    Answer:

12. Explain how it (component mentioned in question 10) works in smoothing process.

    Answer: When the voltage rises, capacitor charges. When rectifier voltage down capacitor release the voltage to the load slowly.

13. Assume that you are going to start a video studio and light it. You need to connect four of 12V 3W Incandescent light bulbs as the load of the above rectifier circuit. Calculate the current through a single bulb.

    Answer: $P = VI$
    $3 = 15I$
    $I = 0.2A$

14. In EWB, redesign the previous rectifier circuit appropriately to the given scenario in question 13. Attach a screenshot of the circuit.

15. By referring the given Zener diode electrical characteristic table, decide the Zener diode that you are going to use? Give the reason for choosing it.

    Answer: 1N4728

16. Calculate the Zener resistor value with its wattage.

    Answer:

17. Assume one of the bulb has burned (Remove the wire connection of a one bulb in circuit diagram). What is the new load voltage?

    Answer:

18. Give the reason for the new load voltage.

    Answer:

19. Upload a screenshot of the circuit.

20. Reconnect the bulb. By using an operational amplifier add two noise signals (50 Hz/ 5 mV and 20 kHz/8 mV) to the circuit. (Add it with rectifier output)
    Upload a full window screenshot of the circuit.

21. If you need to remove these frequencies what type of filter you need to use? Explain why you use it.

    Answer: bandpass filter

ELECTRICAL CHARACTERISTICS (25 °C Ambient Temperature unless otherwise noted)

SYMBOL	V_Z	Z_Z	I_{ZT}	Z_{ZK}	I_{ZK}	I_R	V_{RT}	I_{ZM}	I_Z (surge)
Characteristics	Nominal Zener Votlage @I_{ZT} (*See note*)	Max Zener Imped. @I_{ZT}	Test Current	Max. Zener Imped. @I_{ZK}	Test Current	Max. Reverse Current @V_{RT}	Test Voltage	Max. Zener Current	Max. Zener Surge Current
UNIT	V	Ω	mA	Ω	mA	µA	V	mA	mA
1N4728	3.3	10.0	76.0	400	1.0	100	1.0	276	1380
1N4729	3.6	10.0	69.0	400	1.0	100	1.0	252	1260
1N4730	3.9	9.0	64.0	400	1.0	50	1.0	234	1190
1N4731	4.3	9.0	58.0	400	1.0	10	1.0	217	1070
1N4732	4.7	8.0	53.0	500	1.0	10	1.0	193	970
1N4733	5.1	7.0	49.0	550	1.0	10	1.0	178	89
1N4734	5.6	5.0	45.0	600	1.0	10	2.0	162	810
1N4735	6.2	2.0	41.0	700	1.0	10	3.0	146	730
1N4736	6.8	3.5	37.0	700	1.0	10	4.0	133	660
1N4737	7.5	4.0	34.0	700	0.5	10	5.0	121	605
1N4738	8.2	4.5	31.0	700	0.5	10	6.0	110	550
1N4739	9.1	5.0	28.0	700	0.5	10	7.0	100	500
1N4740	10.0	7.0	25.0	700	0.25	10	7.6	91	454
1N4741	11.0	8.0	23.0	700	0.25	5.0	8.4	83	41
1N4742	12.0	9.0	21.0	700	0.25	5.0	9.1	76	380
1N4743	13.0	10.0	19.0	700	0.25	5.0	9.9	69	344
1N4744	15.0	14.0	17.0	700	0.25	5.0	11.4	61	304
1N4745	16.0	16.0	15.5	700	0.25	5.0	12.2	57	285
1N4746	18.0	20.0	14.0	750	0.25	5.0	13.7	50	250
1N4747	20.0	22.0	12.5	750	0.25	5.0	15.2	45	225
1N4748	22.0	23.0	11.5	750	0.25	5.0	16.7	41	205
1N4749	24.0	25.0	10.5	750	0.25	5.0	18.2	38	190
1N4750	27.0	35.0	9.5	750	0.25	5.0	20.6	34	170
1N4751	30.0	40.0	8.5	1000	0.25	5.0	22.8	30	150
1N4752	33.0	45.0	7.5	1000	0.25	5.0	25.1	27	135