

Experiment No : 01

SPECTRUM ANALYSER AND OBSERVE SPECTRUM

Aim: To study spectrum Analyser and observe the spectrum of sinusoidal signal and square wave.

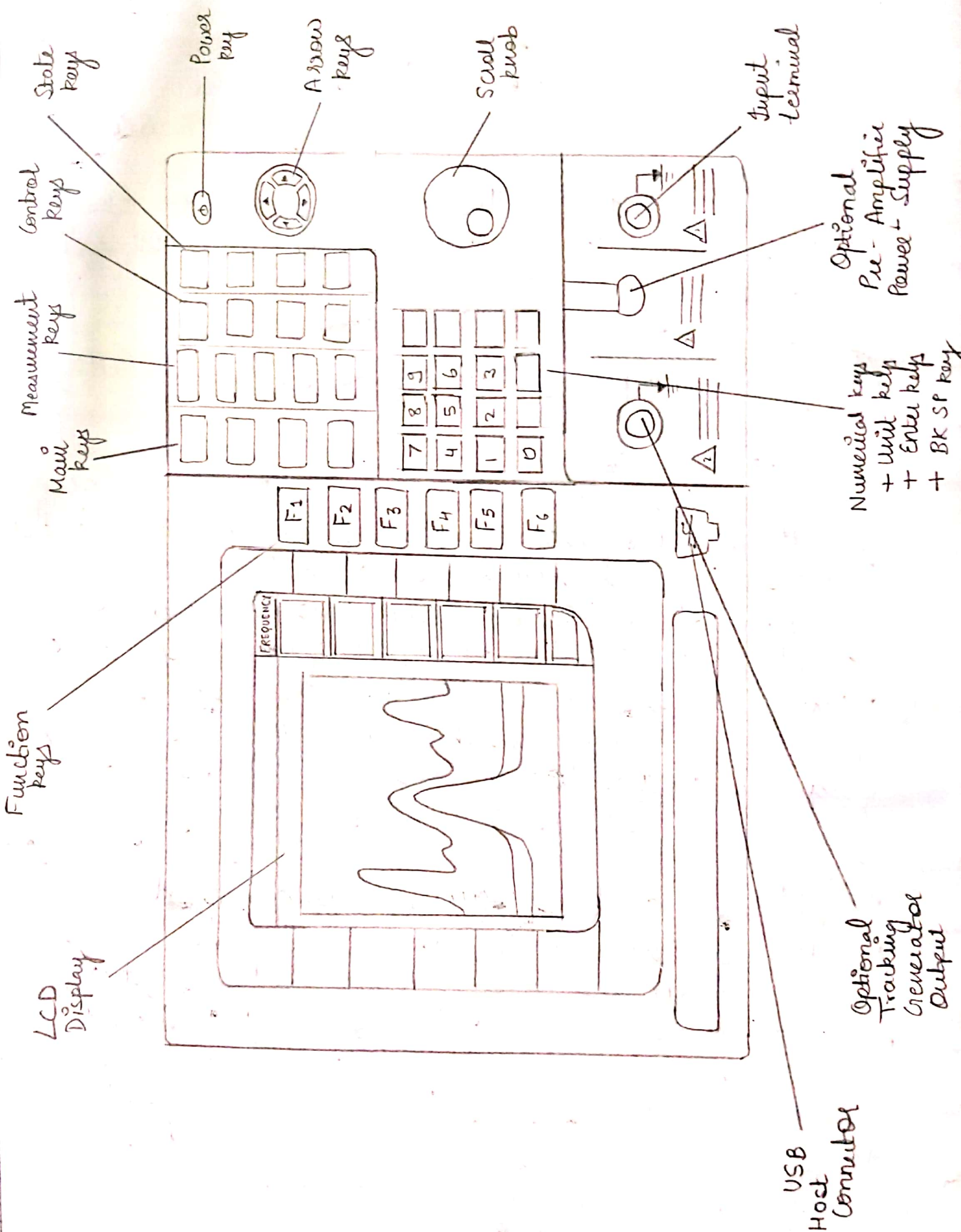
Apparatus: Spectrum Analyser (9KHz - 3GHz)
Function generator

Theory: A spectrum analyser is a laboratory instrument that displays signal amplitude (strength) as it varies by signal frequency. The frequency appears on the horizontal axis, and the amplitude is displayed on the vertical axis. To the casual observer, a spectrum analyser looks like an oscilloscope and, in fact, some lab instruments can function either as oscilloscopes or spectrum analyzers.

A spectrum analyzer can be used to determine whether or not a wireless transmitter is working according to federally defined standards for purity of emissions. Output signals at frequencies other than the intended communications frequency appear as vertical lines (pips) on the display.

A spectrum analyzer can also be used to determine, by direct observation, the bandwidth

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of digital or analog signal.

A spectrum analyzer interface is a device that can be connected to a wireless receiver or a personal computer to allow visual detection and analysis of electromagnetic signals over a defined band of frequencies.

FEATURES OF LAB INSTRUMENT GSP-830 (GRWINSTEK)

- 5 markers with delta marker and peak functions
- 3 traces
- Split windows with separate settings
- 6.4" TFT color LCD, 640x480 resolution
- AC/DC/battery multi-mode power operation
- AutoSet
- 1 kHz - 3 GHz frequency range

1) FREQUENCY

- Frequency/Span: The frequency key, together with span key sets the frequency scale
- View Signal (Center & Span): Center and Span method defines the center frequency and the left/right bandwidth (span) to locate the signal
- Setting frequency adjustment step: Frequency adjustment step defines the arrow keys resolution for center, start and stop frequency

Panel Operation:

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- Press frequency key
- Press F₄ (step)
- Enter the value using numerical and unit keys, arrow keys and scroll rope.

2) RANGE: 9 KHz to 8 GHz

3) SET CENTER FREQUENCY

Panel Operations:

- Press frequency key
- Press F₁ (center)
- Enter the value using numerical & unit keys, arrow keys and scroll rope

4) SET FREQUENCY SPAN

Panel Operations:

- Press span key
- Press F₁ (span)
- Enter the value using numerical and unit keys, arrow keys and scroll rope.

5) VIEW SIGNAL (START & STOP)

- Start and stop method defines the beginning and the end of frequency range
- Arrow keys and scroll knob resolution: 1/10 of span

6) SET START FREQUENCY

Panel operation:

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- Press frequency key
- Press F_2 (start)
- Enter the value using numerical and unit keys, arrow keys and scroll rope

7) SET STOP FREQUENCY

Panel Operation:

- Press frequency key
- Press F_3 (stop)
- Enter the value using numerical keys, arrow keys and scroll rope

8) FULL OR ZERO SPAN

Full or zero span setting sets the span to extreme values: 3GHz (full) or 0kHz (zero) they provide faster ways to view signals in certain situations such as in time domain (0 span) for viewing modulation or in full span for viewing signals with unknown frequencies.

9) DISPLAY FULL FREQUENCY SPAN

Panel Operation:

- Press the span key
- Press F_2 (full span)
- Range: 3GHz (fixed)
- Full span also sets these parameters to fixed values
- Center frequency: 1.5 GHz
- Start frequency: 0kHz
- Stop frequency: 3GHz

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10) ZERO SPAN DISPLAY

- Zero span display can be obtained by pressing F3 key
- Start frequency and stop frequency remains same as that of center frequency
- Note: Last span setting can be recalled by F4 key

AMPLITUDE SELECTION AND SETTING METHODS1) AMPLITUDE

- Amplitude key sets vertical attribute of the display, including the upper limit (reference level), vertical range (amplitude scale), vertical unit and compensation for external gain or loss (external offset)

2) SET VERTICAL SCALE

- Vertical display scale is defined by reference amplitude, amplitude range, measurement unit and external gain/loss.

3) SET REFERENCE AMPLITUDE

- The reference level defines the amplitude at the top of the displayed range.

Panel operation:-

- Press amplitude key
- Press F3 (reference level)
- Enter the value using numerical & unit keys, arrow keys and scroll knob - Arrow keys & scroll knob, scroll knob resolution: vertical Scale.

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Range:

- dBm -110 to +20dBm, 0.1dB resolution
- dBmV -63.1 to 66.99dBmV, 0.01dB resolution
- dBuV -3.01 to 126.99dBuV, 0.01dB resolution

4) SELECT AMPLITUDE SCALE

Panel Operation:

- Press amplitude key
- Press F2 (Scale dB/Div)
- Repeatedly to select the scale

Range: 10, 5, 2, 1 dB/Div

Panel Operation:

- Press amplitude key
- Press F3 (Units)
- Select and press the unit from F1 (dBm), F2 (dBmV) and F3 (dBuV)
- Press F6 (return) to go back to previous menu
- dBm -110 to +20dBm, 0.1dB resolution
- dBmV -63.1 to 66.99dBmV, 0.01dB resolution
- dBuV -3.01 to 126.99dBuV, 0.01dB resolution
- Set external offset level.

5) BACKGROUND:

- External offset compensates the amplitude gain or loss caused by an external network or device.
- Panel Operation:
- Press amplitude key

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- Press F4 (external gain)
- Enter the value using numerical and unit keys, arrow keys and scroll knob

Range:

-20 dB to +20 dB, 0.1 dB resolution

Icon:

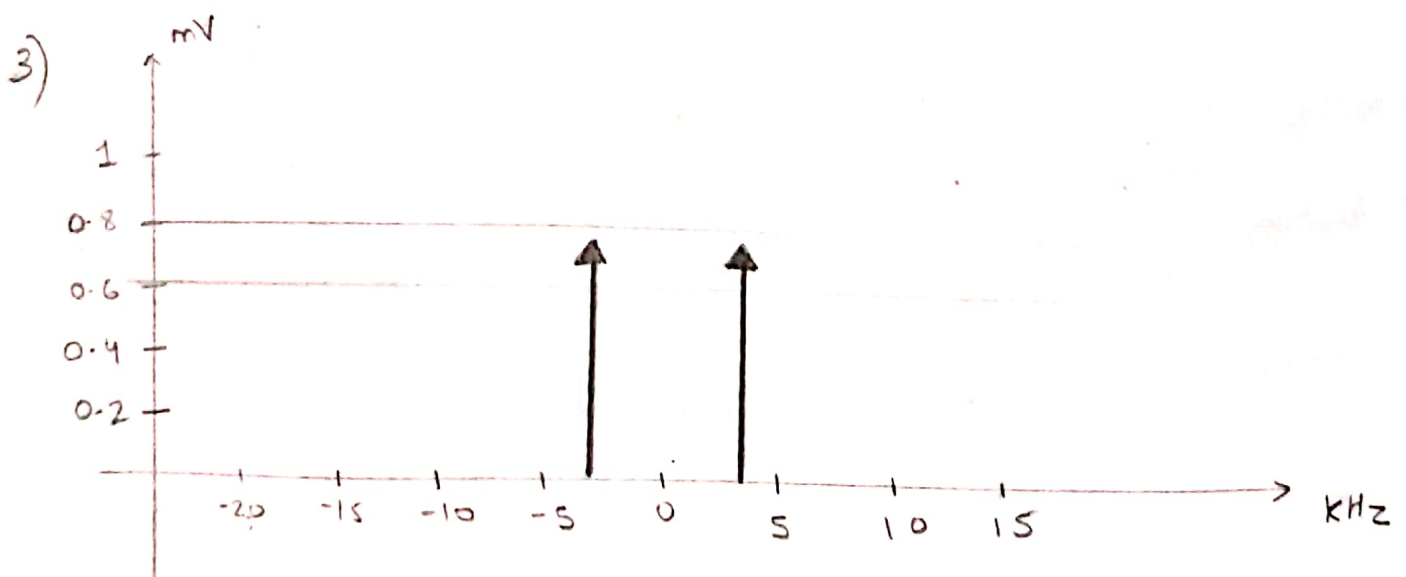
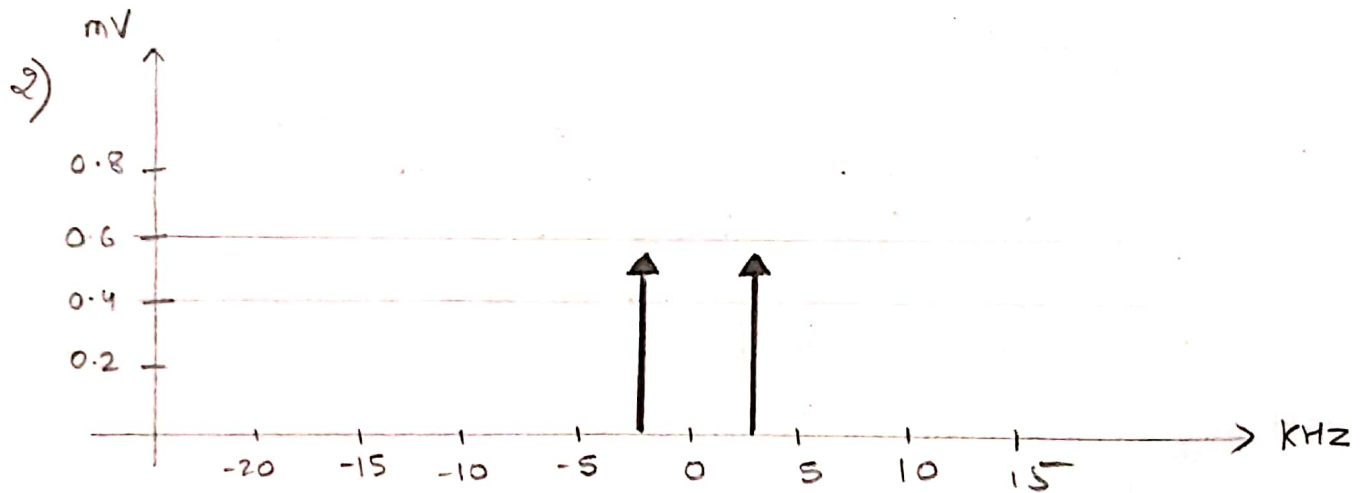
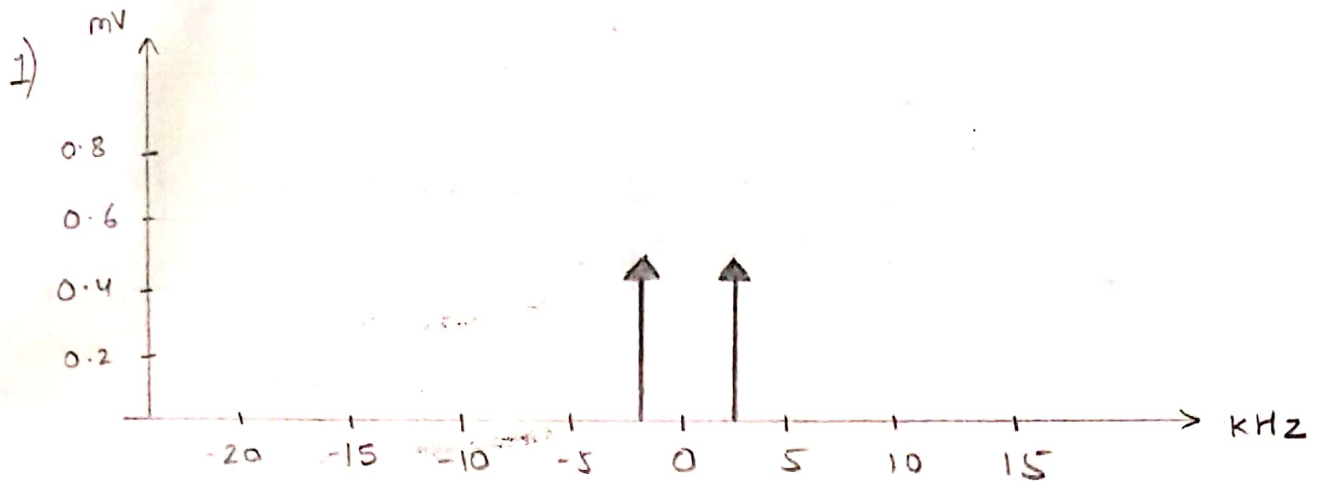
- The amplitude icon appears at the bottom of the display when the external offset changes
- To check whether Spectrum analyzer working properly.
- Generate Auxiliary signal: Press system key, press auxiliary signal, select on option from side given menu, following signal will generate. It generates 10 MHz signal with 10 dB amplitude

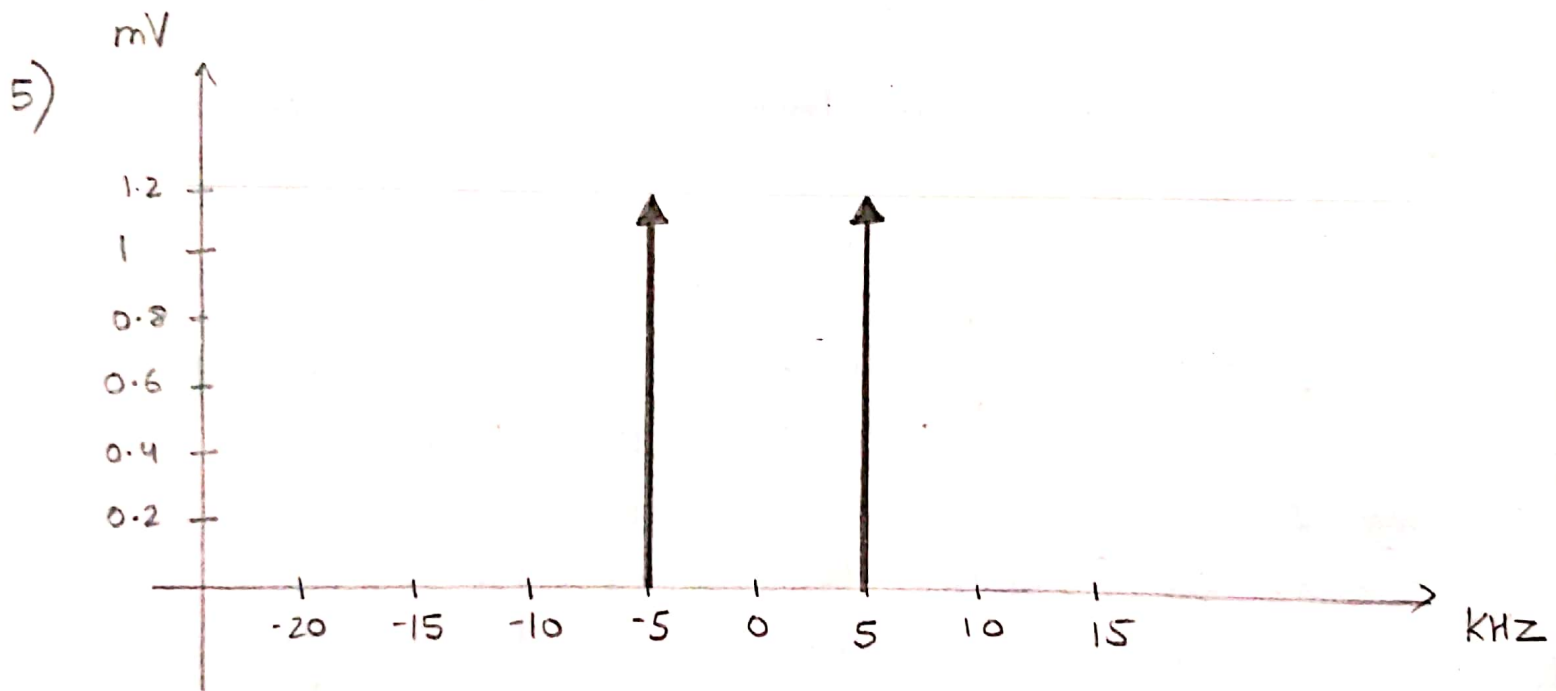
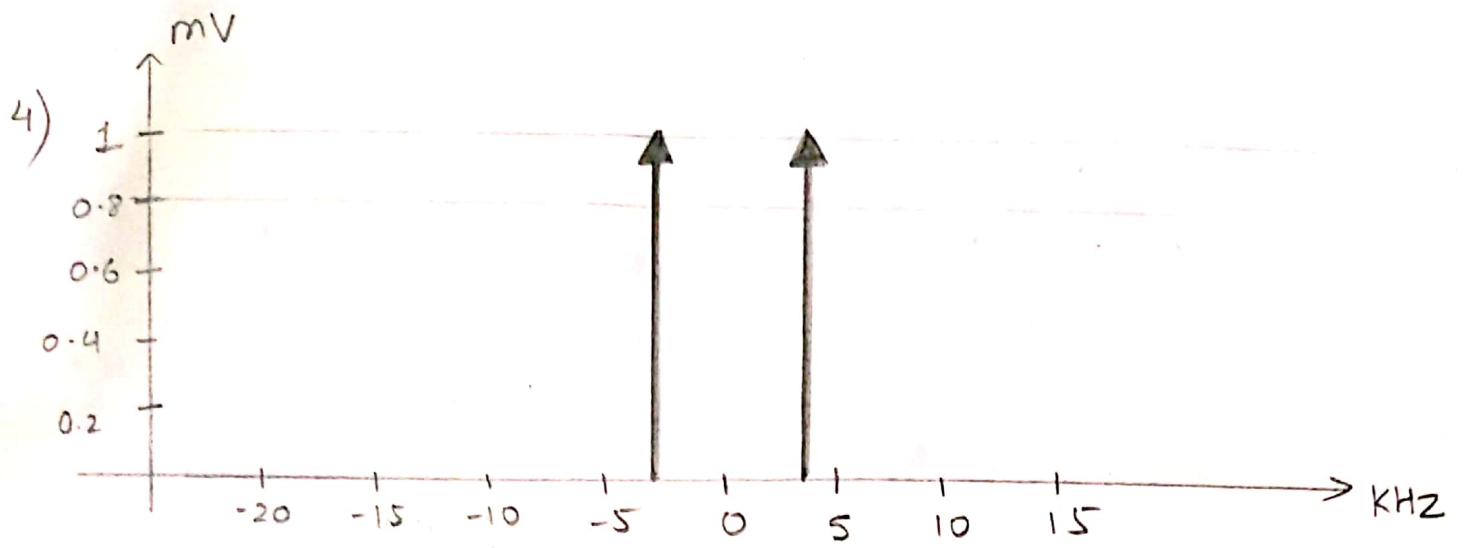
Observation:

WAVEFORM : SINE		
SNo.	Frequency (kHz)	Amplitude (mv)
1)	2	1
2)	2.5	1.1
3)	3	1.5
4)	3	2
5)	5	2.4

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WAVEFORM : SINE





WAVEFORM : SQUARE

S.No	Frequency (KHz)	Amplitude (mV)
1)	2	1
2)	2.5	1.2
3)	3	1.5
4)	4	1.6
5)	5	2

Conclusion :

Hence, successfully verified and analyzed the spectrum of sine and square wave-form for different frequency and amplitude.

WAVEFORM : SQUARE

