Fastest finger first project report

Abstract

In the buzzer round of quiz contests, the question is thrown open to all the teams. The person who knows the answer hits the buzzer first and then answers the question. Sometimes two or more players hit the buzzer almost simultaneously and it is very difficult to detect which of them has pressed the buzzer first. In television shows, where the whole event is recorded, the actions are replayed in slow motion to detect the first hit. Such slow motions are possible only where huge funds are available to conduct the show. For this reason buzzer rounds are avoided for quiz contests held in colleges.

This project is an electronic quiz buzzer that is affordable by the colleges and even individuals. This project is useful for a 4-team quiz contest, although it can be modified for more number of teams. This system is sensitive. The circuit can detect and record the first hit contestant among all the contestants that may appear to be simultaneous Buzzer controllers for 4-team quizzes are readily available in the market. However, buzzer controller capable handling six or eight team are hard to find. The circuit presented here can be used for up to eight teams. It can be easily expanded to accommodated more teams through suitable cascading of latches and AND gates along with transistors, relays, etc.

In the buzzer round of any quiz contest question are thrown open to all the participating teams. Each team has a push button switch to ring the buzzer. After hearing the question any member of a team who knows the answer and hits there switch first gets a chance to answer. In multiple cases who hit the switch first gets the opportunity to reply. For next round the quiz master

reset the buzzer operation circuit by pressing the reset switch. For visual indication all teams have the lamp fitted on their desk. The lamps glow until the reset of buzzer controller indicating the eligible team for replying the question. For audio indication the buzzer rings and turns off automatically after a few second. The audio visual circuit is powered through actuation of relay contacts. Here 230v AC has been used.

BLOCK DIAGRAM

Figure: 1

CIRCUIT DIAGRAM

Figure: 2

Figure: 2

Working of Finger first indicator

Fastest finger first indicators (FFFIs) are used to test the player's reaction time. The player's designated number is displayed with an audio alarm when the player presses his entry button. The circuit presented here determines as to which of the 8 contestants first pressed the button and locks out the remaining three entries. Simultaneously, an audio alarm and the correct decimal number display of the corresponding contestant are activated.

When a contestant presses his switch, the corresponding output of latch IC1 (74373) changes its logic state from 1 to 0.

The combinational circuitry comprising dual 4-input NAND gates of IC3 (7430) locks out subsequent entries by producing the appropriate latch-disable signal.

Priority encoder IC2 (74147) encodes the active-low input condition into the corresponding binary coded decimal (BCD) number output.

The outputs of IC4 after inversion by inverter gates inside hex inverter

74LS04 (IC5) are coupled to BCDto-7-segment decoder/display driver IC6 (7447).

The output of IC6 drives common anode 7-segment LED display (DIS. 1, FND507 or LT543).

The audio alarm generator comprises clock oscillator (555), whose output drives a loudspeaker. The oscillator frequency can be varied with the help of

Preset VR1. Logic 0 state at one of the outputs of IC2 produces logic 1 input condition at pin 4 of 555, thereby enabling the audio oscillator.

555 needs +12V DC supply for sufficient alarm level.

The remaining circuit operates on regulated +5V DC supply, which is obtained using (7805). Once the organiser identifies the contestant who pressed the switch first, he disables the audio alarm and at the same time forces the digital display to ‘ 0’ by pressing reset pushbutton S9

PCB FABRICATION

PCB Designing is an important part of the project development, complexity & size the PCB for our Project “ Buzzer Controller For 8-Team Quiz Contests” is made by Photo chemical process on copper clad base materials the following steps are involved in Fabrication.

Layout designing

1. Art work designing 2. Negative preparation

3. Eleclining 4. Cleaning

5. Coating of Protective layer 6. Drilling

7. Testing

Figure: 3LAYOUT DESIGNING:- First of all we have prepared the layout designing on graph paper according to the schematic diagram. To layout diagram shown in the tracks on PCB to join the components as per schematic diagram. Taking the consideration actual size (100%) of each components and pin to pin distance of the components.

ART WORK DESIGNING:- Art work is the preparation after the layout Modification. Art work is prepared on clad shed by tracking the circuit. On it with tapes & different width, circular pads, IC pads & cutter

2. NEGATIVE PREPARETION:- For the preparation of Negative the photographic with feint is to cut to the six of the art work it is then place with film in the vertical photographic camera the developer used in the lithe developer. Which consist of A & B developer mixed in same proportion. The film is then fixed through fixer which is the Sodium Thiosulphate solution the

film then washed with the water and then dried. At least to clean the liquor thinner to protect the tracks from corrosion and moisture effects.

Figure: 4

4. ELECLINING:- It is the process in which extra copper is removed from copper clad sheet with heep & Ferric Chloride(feels) solution. The copper clad sheet is dipped in the feels for about 3 hours. By this process we got the PCB with wanted tracks.

5. CLEANING:- Now remove the dye with help of thinner, wash it with water and dry it in sun light.

6. COATING OF PROTECTIVE LAYERS:- The PCB is now Coated with non-conducting solution. “ LAQUAR” to prevent the tracks from environment hazards like corrosion and moisture effects.

Figure: 5

PCB LAYOUT FOR FINGER FIRST INDICATOR

Figure: 6

7. DRILLING:- Drilling is done to create the components lead holes Drill of 1mm.(Diameter) is used.

8. TESTING:- The copper tracks are tested with the digital multimeter if any track is open &short can be repaired before mounting the components on PCB. Now PCB is ready for assembly.

COMPONENTS LIST

Semiconductors:

IC1 -74LS373

IC2 -74LS147

IC3 -74LS30

IC4 -74LS00

IC5 – 74LS04

IC6 – 74LS47

IC7 -7805, 5V regulator

IC8 – NE555 timer

T1 -BC547 NPN transistor

7- segment display- DIS. 1, FND507 or LT543

Resistors (all1/4-watt, +/-5% carbons):

R1-R8 -1kilo-ohm

R9 -2. 2 kilo-ohm

R10 -R11 – 10-kilo-ohm

R12-R18 – 560 ohm

VR1 -2-mega-ohm preset

Capacitors:

C1 -0. 01microF, 35V electrolytic

C2 – 0. 1microF, 16V electrolytic

C3 – 0. 01microF, ceramic disk

Miscellaneous:

X1 -230V AC primary to 12V, 500mA

Secondary transformer

S1-S8 -push-to-on switch

S9 – push-to-off switch

BELL -230V AC electric bell

Details of various components used

Figure: 71. 74LS373

Figure: 8

2. 74LS147

Figure: 9

Figure: 10

3. 74LS30

Figure: 11

Internal description of 74LS30

Figure: 12

Figure: 13

5. 74LS04

Figure: 14

Figure: 15

6. 74LS00

Figure: 16

Figure: 18

Figure: 17

Figure: 19

Figure: 20

7. IC7447

Figure: 20

8 . Transformer

Figure: 21

Laminated steel core

Transformers for use at power or audio frequencies typically have cores made of high Permeability (electromagnetism) permeabilitysilicon steel.

permeability many times that of free space, and the core thus serves to greatly reduce the magnetizing current, and confine the flux to a path which closely couples the windings.

Early transformer developers soon realized that cores constructed from solid iron resulted in prohibitive eddy-current losses, and their designs mitigated this effect with cores consisting of bundles of insulated iron wires. Later designs constructed the core by stacking layers of thin steel laminations, a principle that has remained in use. Each lamination is insulated from its neighbors by a thin non-conducting layer of insulation. indicates a minimum cross-sectional area for the core to avoid saturation.

The effect of laminations is to confine eddy currents to highly elliptical paths that enclose little flux, and so reduce their magnitude. Thinner laminations reduce losses, Thin laminations are generally used on high frequency transformers, with some types of very thin steel laminations able to operate up to 10 kHz.

One common design of laminated core is made from interleaved stacks of pieces, leading to its name of “ E-I transformer”. Such a design tends to exhibit more losses, but is very economical to manufacture. The cut-core or C-core type is made by winding a steel strip around a rectangular form and then bonding the layers together. It is then cut in two, forming two C shapes, and the core assembled by binding the two C halves together with a steel strap. They have the advantage that the flux is always oriented parallel to the metal grains, reducing reluctance.

A steel core’s means that it retains a static magnetic field when power is removed. When power is then reapplied, the residual field will cause a high until the effect of the remaining magnetism is reduced, usually after a few cycles of the applied alternating current. Over current protection devices such as must be selected to allow this harmless inrush to pass. On transformers connected to long, overhead power transmission lines, induced currents due to during can cause saturation of the core and operation of transformer protection devices.

The transformer converts the 220 V AC into 9 V AC. The Bridge wave rectifier converts the (V AC into rippled DC. This rippled DC is given as input to the 7805/7809 Voltage regulator IC. A separate power supply is given for the Stepper Motor which has the same power supply setup for converting the 220 V AC into 9V DC.

The DC Power Supply circuit is based around the 7805 voltage regulator. It has only 3 connections (input, output and ground) and it provides a fixed output. The last two digits of the part number specify the output voltage, eg. 05, 06, 08, 10, 12, 15, 18, or 24. The 7800 series provides up to 1 amp load current and has on-chip circuitry to shut down the regulator if any attempt is made to operate it outside its safe operating area. (If this happens to you, let the chip cool down & attach the heatsink.) It can be seen that there are in fact two separate circuits in this power supply. One 7805 is directly connected as a fixed 5V regulator. The second 7805 has a resistor divider network on the output. A variable 500 ohm potentiometer is used to vary the output voltage from a minimum of 5V up to the maximum DC voltage

depending on the input voltage. It will be about 2V below the input DC voltage.)

The capacitor across the output improves transient response. The large capacitor across the input is a filter capacitor to help smooth out ripple in the rectified AC voltage. The larger the filter capacitor the lower the ripple

IC-7805

One can get a constant high-voltage power supply using inexpensive 3-terminal voltage regulators through some simple techniques described below. Depending upon the current requirement, a reasonable load regulation can be achieved. Line regulation in all cases is equal to that of the voltage regulator used.

Though high voltage can be obtained with suitable voltage boost circuitry using ICs like LM 723, some advantages of the circuits presented below are: simplicity, low cost, and practically reasonable regulation characteristics. For currents of the order of 1A or less, only one zener and some resistors and capacitors are needed. For higher currents, one pass transistor such as ECP055 is needed.

Before developing the final circuits, let us first understand the 3-terminal type constant voltage regulators. Let us see the schematic in Fig. where 78XX is a 3-terminal voltage regulator.

Schematic for obtaining low-voltage regulated output using 3-terminal

Figure: 22

voltage regulators.

Rectified and filtered unregulated voltage is applied at VIN and a constant voltage appears between pins 2 and 2 of the voltage regulator. *The distribution of two currents in the circuit (IBIAS and ILOAD) is as shown.

It is highly recommended to use the two capacitors as shown. Electrically regulator will be at a distance from the rectifier supply. Thus, a tantalum grade capacitor of 5mf and rated voltage is good. Electrolytic capacitor is not suitable for it is poor in response to load transients, which have high frequency components. At the output side a 0. 22mf disc ceramic capacitor is useful to eliminate spurious oscillations, which the regulator might break into because of its internal high gain circuitry.

Figure: 23

These voltage regulators have a typical bias current of 5 mA, which is reasonably constant. By inserting a small resistor Rx between pin 2 and ground, the output voltage in many cases. By this method voltage increment of 5 to 10 per cent is practically feasible. However, if a high-value resistance is used to obtain a higher output voltage, a slight variation in bias current will result in wide variation of the output voltage.

8. BC547 Transistor

In electronics, a transistor is a semiconductor device commonly used to amplify or switch electronic signals. A transistor is made of a solid piece of a semiconductor material, with at least three terminals for connection to an external circuit. A voltage or current applied to one pair of the transistor’s

terminals changes the current flowing through another pair of terminals. Because the controlled (output) power can be much larger than the controlling (input) power, the transistor provides amplification of a signal. The transistor is the fundamental building block of modern electronic devices, and is used in radio, telephone, computer and other electronic systems. Some transistors are packaged individually but most are found in integrated circuits.

Figure: 24

Features

- NPN Silicon Epitaxial Planar Transistors

- These transistors are subdivided into three groups

A, B, and C according to their current gain. The type BC546 is available in groups A and B, n however, the types BC547 and BC548 can be supplied in all three groups. As complementary

types the PNP transistors BC556...BC558 are recommended.

- On special request, these transistors are also manufactured in the pin configuration TO-18.

Mechanical Data

Case: TO-92 Plastic Package

Weight: approx. 0. 18g

Packaging Codes/Options:

E6/Bulk – 5K per container, 20K/box

E7/4K per Ammo mag., 20K/box

Figure: 25

9. Ceramic capacitor:

These are the disk-type ceramic capacitors. Because the high frequency characteristic is good, these are used as the coupling capacitors (It cuts the direct current but it lets through the alternating current.

Figure: 26

10. Electrolytic Capacitor:

This capacitor is used as the ripple filter capacitor of the power circuit.

There is polarity. So, be careful so as not to make a mistake when mounting it.

Figure: 27

Electrolyte Capacitor

Figure: 28

Metallised Polyester Film Capacitors

With tolerance of 10%.

Operating temperature -40oC to +85oC.

Compact Size

Non Inductive Design

11. RESISTANCE

Resistance is the opposition of a material to the current. It is measured in Ohms (Ω). All conductors represent a certain amount of resistance, since no conductor is 100% efficient. To control the electron flow (current) in a predictable manner, we use resistors. Electronic circuits use calibrated lumped resistance to control the flow of current. Broadly speaking, resistor can be divided into two groups viz. fixed & adjustable (variable) resistors. In fixed resistors, the value is fixed & cannot be varied. In variable resistors, the resistance value can be varied by an adjusteknob. It can be divided into (a) Carbon composition (b) Wire wound (c) Special type. The most common type of resistors used in our projects is carbon type. The resistance value is normally indicated by colour bands. Each resistance has four colours, one of the band on either side will be gold or silver, this is called fourth band and indicates the tolerance, others three band will give the value of resistance (see table). For example if a resistor has the following marking on it say red, violet, gold. Comparing these coloured rings with the colour code, its value is 27000 ohms or 27 kilo ohms and its tolerance is ±5%. Resistor comes in various sizes (Power rating). The bigger, the size, the more power rating of 1/4 watts. The four colour rings on its body tells us the value of resistor value as given below.

COLOURS CODE

Black 0

Brown 1

Red 2

Orange 3

Yellow 4

Green 5

Blue 6

Violet 7

Grey 8

White 9

Figure: 29

The first rings give the first digit. The second ring gives the second digit. The third ring indicates the number of zeroes to be placed after the digits. The fourth ring gives tolerance (gold ±5%, silver ± 10%, No colour ± 20%).

In variable resistors, we have the dial type of resistance boxes. There is a knob with a metal pointer. This presses over brass pieces placed along a circle with some space b/w each of them.

Resistance coils of different values are connected b/w the gaps. When the knob is rotated, the pointer also moves over the brass pieces. If a gap is skipped over, its resistance is included in the circuit. If two gaps are skipped over, the resistances of both together are included in the circuit and so on.

12. The 555 TIMER

Description

The LM555/NE555/SA555 is a highly stable controller capable of producing accurate timing pulses. With a monostable operation, the time delay is controlled by one external resistor and one capacitor. With an astable operation, the frequency and duty cycle are accurately controlled by two external resistors and one capacitor.

Figure: 30

Features

- High Current Drive Capability (200mA)

- Adjustable Duty Cycle

- Temperature Stability of 0. 005%/½°C

- Timing FromÎ¼Sec to Hours

- Turn off Time Less Than 2Î¼Sec

Applications

- Precision Timing

- Pulse Generation

- Time Delay Generation

- Sequential Timing

Pin Description of 555 Timer

Figure: 31

Power supply:

Pin 8 is used to connect the positive power supply (Vs) to the 555. This can be any voltage between 3V and 15V DC, but is commonly 5V DC when working with digital ICs. Pin 1 is the 0V connection to the power supply.

Trigger and Reset Inputs:

Pin 2 is called the trigger input as it is this input that sets the output to the high state. Pin 4 is called the reset input as it is this input that resets the o/p to the low state. Both pins may be connected to push buttons to control the operation of the 555. Sometimes the reset input is not used in a circuit, in which case it is connected directly to Vs to that unwanted resetting can’t occur.

Threshold and discharge:

Pins 6 and7 (and sometimes the Trigger i/p, pin2) are used to set up the timing aspect of the 555 IC. They are normally connected to a combination of resistors and a capacitor.

Offset:

Pin 5 can be used to alter the timing aspect of the 555 IC in applications such as frequency modulation.

Output:

Pin 3 is the digital output of the 555. It can be connected directly to the inputs of other digitaICs, or it can control other devices

Figure: 32

When the low signal input is applied to the reset terminal, the timer output remains low regardless of the threshold voltage or the trigger voltage. Only when the high signal is applied to the reset terminal, the timer's output changes according to threshold voltage and trigger voltage. When the threshold voltage exceeds 2/3 of the supply voltage while the timer output is high, the timer's internal discharge Tr. turns on, lowering the threshold voltage to below 1/3 of the supply voltage. During this time, the timer output is maintained low. Later, if a low signal is applied to the trigger voltage so that it becomes 1/3 of the supply voltage, the timer's internal discharge Tr. turns off, increasing the threshold voltage and driving the timer output again at high.

Fig 33 : Monostable Operation

Figure: 34

Figure 34. illustrates a monostable circuit. In this mode, the timer generates a fixed pulse whenever the trigger voltage falls below Vcc/3. When the trigger pulse voltage applied to the #2 pin falls below Vcc/3 while the timer output is low, the timer's internal flip-flop turns the discharging Tr. off and causes the timer output to become high by charging the external capacitor C1 and setting the flip-flop output at the same time. The voltage across the external capacitor C1, VC1 increases exponentially with the time constant t= RA*C and reaches 2Vcc/3 at td= 1. 1RA*C. Hence, capacitor C1 is charged through resistor RA. The greater the time constant RAC, the longer it takes for the VC1 to reach 2Vcc/3. In other words, the time constant RAC controls the output pulse width. When the applied voltage to the capacitor C1

reaches 2Vcc/3, the comparator on the trigger terminal resets the flip-flop, turning the discharging Tr. on. At this time, C1 begins to discharge and the timer output converts to low. In this way, the timer operating in the monostablerepeats the above process. Figure 10 shows the general waveforms during the monostable operation. It must be noted that, for a normal operation, the trigger pulse voltage needs to maintain a minimum of Vcc/3 before the timer output turns low. That is, although the output remains unaffected even if a different trigger pulse is applied while the output is high, it may be affected and the waveform does not operate properly if the trigger pulse voltage at the end of the output pulse remains at below Vcc/3

Fig 35 : Astable operation

An astable timer operation is achieved by adding resistor RB to Figure 1 and configuring as shown on Figure 5. In the astable operation, the trigger terminal and the threshold terminal are connected so that a self-trigger is formed, operating as a multi vibrator. When the timer output is high, its internal discharging Tr. turns off and the VC1 increases by exponential function with the time constant (RA+RB)*C.

When the VC1, or the threshold voltage, reaches 2Vcc/3, the comparator output on the trigger terminal becomes high, resetting the F/F and causing the timer output to become low. This in turn turns on the discharging Tr. and the C1 discharges through the discharging channel formed by RB and the discharging Tr. When the VC1 falls below Vcc/3, the comparator output on the trigger terminal becomes high and the timer output becomes high again. The discharging Tr. turns off and the VC1 rises again. In the above process, the section where the timer output is high is the time it takes for the VC1 to

rise from Vcc/3 to 2Vcc/3, and the section where the timer output is low is the time it takes for the VC1 to drop from 2Vcc/3 to Vcc/3. When timer output is high, the equivalent circuit for charging capacitor C1 is as follows

Fig 36 : Astable operation Waveform

12. Diode

The simplest semiconductor device is made up of a sandwich of P-type semiconducting material, with contacts provided to connect the p-and n-type layers to an external circuit. This is a junction Diode. If the positive terminal of the battery is connected to the p-type material (cathode) and the negative terminal to the N-type material (Anode), a large current will flow. This is called forward current or forward biased.

If the connections are reversed, a very little current will flow. This is because under this condition, the p-type material will accept the electrons from the negative terminal of the battery and the N-type material will give up its free electrons to the battery, resulting in the state of electrical equilibrium since the N-type material has no more electrons. Thus there will be a small current to flow and the diode is called Reverse biased.

Thus the Diode allows direct current to pass only in one direction while blocking it in the other direction. Power diodes are used in concerting AC into DC. In this, current will flow freely during the first half cycle (forward biased) and practically not at all during the other half cycle (reverse biased). This makes the diode an effective rectifier, which convert ac into pulsating dc. Signal diodes are used in radio circuits for detection. Zener diodes are used in the circuit to control the voltage.

Figure: 37

Some common diodes are:-

1. Zener diode.

2. Photo diode.

3. Light Emitting diode.

ZENER DIODE:-

A zener diode is specially designed junction diode, which can operate continuously without being damaged in the region of reverse break down voltage. One of the most important applications of zener diode is the design of constant voltage power supply. The zener diode is joined in reverse bias to d. c. through a resistance R of suitable value.

PHOTO DIODE:-

A photo diode is a junction diode made from photo- sensitive semiconductor or material. In such a diode, there is a provision to allow the light of suitable frequency to fall on the p-n junction. It is reverse biased, but the voltage applied is less than the break down voltage. As the intensity of incident light is increased, current goes on increasing till it becomes maximum. The maximum current is called saturation current.

LIGHT EMITTING DIODE (LED):-

When a junction diode is forward biased, energy is released at the junction diode is forward biased, energy is released at the junction due to recombination of electrons and holes. In case of silicon and germanium diodes, the energy released is in infrared region. In the junction diode made

of gallium arsenate or indium phosphide, the energy is released in visible region. Such a junction diode is called a light emitting diode or LED.

LIST OF INSRUMENTS &TOOLS

TOOLS:

Soldering Iron

Tweezers

Screw Driver

Cutter

De Soldering Pump

INSTRUMENTS:

Digital Multimeter

OTHER MATERIALS:

Solder

Flux

De Soldering Wick

Soldering Iron Stand

Image of project

Figure: 38

Applications:

1. Electronic Jam Is Commonly Used In Quiz Contests

Figure: 39

2. Finger First Is The Basic Principle

3. It Adds Beauty To Active Quiz Shows Contains Many

Buzzer Rounds

4. Inputs Can Be Handle At A Time

Figure: 40

5. Uses Seven Segment Display Instead of LED/bulb

For Visual Interface

6. This Electronic Jam Is Built With The View Of Making

The Game Show Priority Less

Advantages:

Handy device

Low power consumption

More accurate

Easy to use

Visual interface adds its advantage

Disadvantages:

Input is limited to eight.

Future scope:

Instead of Seven Segment display LCD

screens can be implemented

Priority list of all inputs can be imparted in

Output

Conclusion:

Project Aims the Implemenatation of ‘ Electonic Jam’ for making Quiz shows

priority Less

Seven Segment display included for more User nterface

Cost of Project:

S. No.

Component

Quantity

Cost

1.

IC74373

1

60

2.

IC 555

1

30

3.

IC 7430

1

60

4.

IC 7447

1

35

5.

IC 74147

1

65

6.

IC7400

1

24

7.

IC7404

1

20

8.

Transistor

1

3

9.

Diode

2

4

10.

7 segment display

1

20

11.

Transformer

1

40

12.

Ceramic Capacitor

2

4

13.

Electrolytic Capacitors

1

5

14.

Resistor

18

40

15.

PCB designing

—

600

16.

Misc(Solder wire, connecting wire, Connectors etc)

—

200

Total

1210