1- What is the primary purpose of a CDS photo coupler in electronic circuits?

a) To amplify signals

b) To generate power

c) To transmit signals across isolated circuits

d) To regulate voltage levels

2- What components are typically present in a CDS photo coupler package?

a) Transistor and capacitor

b) Diode and resistor

c) LED and photodetector

d) Transformer and inductor

3- What is a potential limitation of CDS photo couplers in terms of signal transmission?

a) They are not suitable for digital signals

b) They introduce delays due to the LED

c) They have very high bandwidth

d) They only work with low voltages

4- Which part of a CDS photo coupler emits light when current flows through it?

a) Photodetector

b) LED

c) Transistor

d) Capacitor

5- How does a photo reflector typically work?

a) It emits light and measures the reflection time

b) It emits sound waves and measures their reflection

c) It emits radio waves and measures their reflection

d) It emits light and detects changes in the reflected light

6- What is a common application of photo reflectors?

a) Data encryption

b) Audio amplification

c) Object detection

d) Voltage regulation

7- In what condition does the output of a photo reflector change?

a) When exposed to any form of light

b) When the input voltage changes

c) When the temperature changes

d) When there is a change in reflected light intensity

8- What is the color code of 333kΩ, ± 5% five-band resistor?

a) Orange, Orange, Red, Orange, Gold

b) Orange, Orange, Orange, Orange, silver

c) Orange, Orange, Orange, Red, Gold

d) Orange, Orange, Orange, Orange, Gold

9- What is the color code for a 5KΩ, tolerance ± 5% resistor?

a) Green, Black, Red, Silver

b) Green, Brown, Orange, Gold

c) Green, Black, Red, Gold

d) Green, Brown, Red, Gold

10- What is the value of a 4 band resistor which has the first band – Green, the second band – Blue, the third band- orange, the fourth band – Gold?

a) 56K ± 10%

b) 56K ± 5%

c) 5.6K ± 5%

d) 56K ± 2%

11- Explain the idea of using the flyback diode, how it works, and why it protects the components in the circuit.

It is an essential component used in circuits containing inductive loads, such as relays, solenoids, motors, and transformers. Its primary purpose is to provide a path for the flow of current when the voltage across the inductive load suddenly changes, thus protecting other components in the circuit from voltage spikes and potentially damaging effects.

When an inductive load is active and carrying current, it stores energy in its magnetic field. When the current through the inductor is interrupted, as might happen when a switch is opened or a relay is turned off, the inductor resists the change in current by generating a voltage spike in an attempt to maintain the flow of current. This phenomenon is governed by Faraday's law of electromagnetic induction.

Without any mitigation, this voltage spike can cause several issues:

- Voltage Overstress: The voltage spike can exceed the voltage rating of other components in the circuit, potentially causing breakdown and failure.
- Interference: The voltage spike can induce electromagnetic interference (EMI) in nearby circuits, leading to signal integrity issues or even disrupting the functioning of other electronic devices.
- Component Damage: Sensitive components, such as transistors or integrated circuits, can be damaged due to the excessive voltage.

A flyback diode works to mitigate these issues:

- Path for Inductive Current: The flyback diode is connected in parallel with the inductive load, but in the reverse-biased direction. When the current through the inductor is interrupted, the voltage spike attempts to maintain the current flow by driving it through the diode. The diode provides a low-resistance path for the current to circulate safely. Since the diode is reverse-biased during normal operation, it does not conduct under normal conditions.
- Voltage Clamp: As the voltage across the inductor rises due to the voltage spike, the flyback diode becomes forward-biased and starts conducting. This allows the excessive voltage to be clamped to a safe level (usually around the diode's forward voltage drop), preventing it from reaching harmful levels and thus protecting the rest of the circuit.
- Current Dissipation: The energy stored in the inductor's magnetic field is dissipated as heat in the flyback diode during its conduction phase. This prevents the energy from causing voltage stress on other components.

12- What resistance must be placed in parallel with a 155-Ω resistor to make the equivalent resistance 115 Ω?

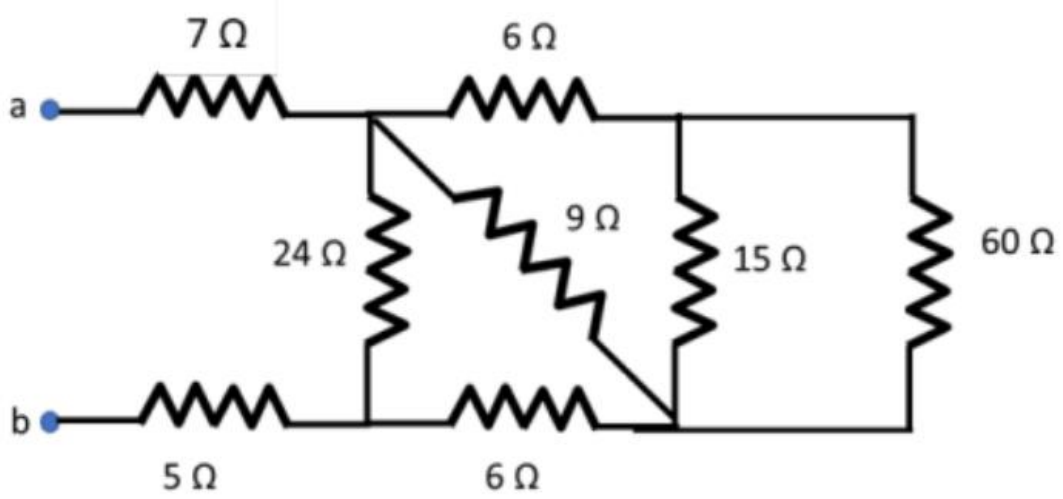
445.625 Ω

13- When using a microcontroller to control a common anode 7-segment display, what logic level is typically applied to the segment pins to turn them on?
a) High logic level (1).
b) Low logic level (0).
c) It varies based on the display's design.
d) Both high and low logic levels are used interchangeably.

14- If you want to display the digit "0" on a common anode 7-segment display, which segments need to be activated?
a) Segments a, b, c, d, e, and g.
b) Segments a, b, c, d, e, and f
c) Segment g only
d) none of the above

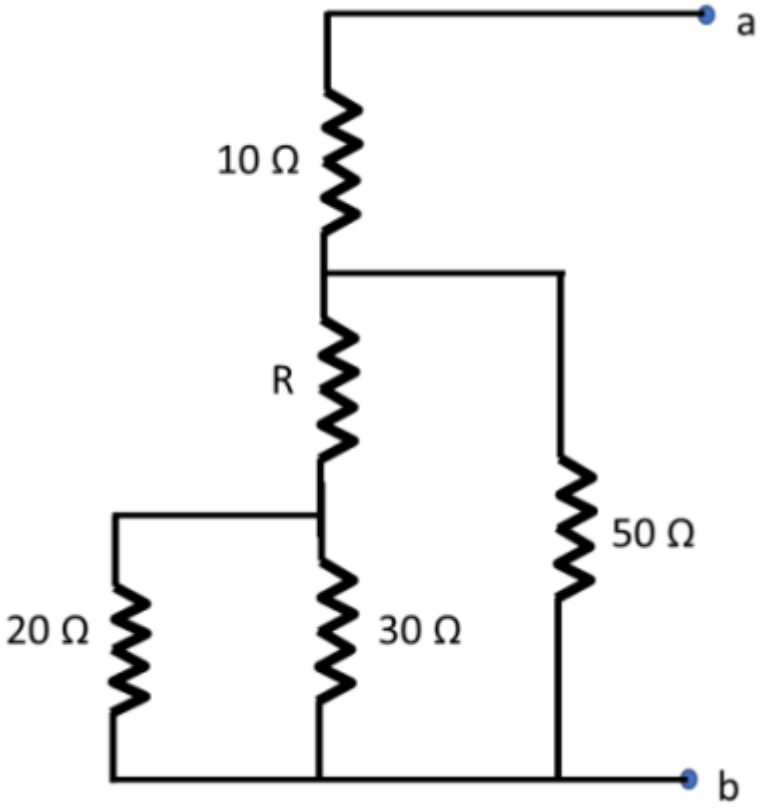
15- What is the primary purpose of a 3-state buffer?
a) To amplify input signals
b) To convert analog to digital signals
c) To control the flow of data onto a bus
d) To perform arithmetic operations

16- Determine the equivalent resistance for this circuit.



20 Ω

17- If the equivalent resistance at terminals a b is Rab = 20 Ω What is the value of R that makes Rab = 20 Ω



.5 Ω