Prepp

Your Personal Exams Guide

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RRB ALP 2019 (CBT 2) (Electronic Mechanic) Previous Year Papers (21 Jan 2019) Shift 2

Total Time: 1 Hour **Total Marks:** 75

Instructions

Sl No.	Section Name	No. of Question	Maximum Marks	Negative Marks	Positive Marks
1	Part B	75	75	0.33	1

1.) A total of 60 minutes is allotted for the examination.

2.) The server will set your clock for you. In the top right corner of your screen, a countdown timer will display the remaining time for you to complete the exam. Once the timer reaches zero, the examination will end automatically. The paper need not be submitted when your timer reaches zero.

3.) There will, however, be sectional timing for this exam. You will have to complete each section within the specified time limit. Before moving on to the next section, you must complete the current one within the time limits.

Part B

1. The deflection torque in moving iron meter is_ _ _ _ _ _ _ _ **(+1, -0.33)**

   a. Inversely proportional to square of the current

   b. Proportional to the square of the current

   c. Proportional to the square of the voltage

   d. Inversely proportional to the current

---

2. Which one of the following can be used to test the characteristics of an OFC? **(+1, -0.33)**

   a. OTMM (Optical Transceiver Monitoring Module)

   b. DTDR (Digital Time Domain Reflectometer)

   c. OTDR (Optical Time Domain Reflectometer)

   d. OFCM (Optical Fiber Communication Module)

---

3. An LCR meter is used to measure _ _ _ _ _ _. **(+1, -0.33)**

   a. current

   b. power

   c. inductance

   d. voltage

---

4. Three capacitors each of 1μF, 2μF and 3μF are connected in series. Identify the statement which holds TRUE for this combination **(+1, -0.33)**

a. The charge stored by each capacitor is same.

b. Current flowing through each capacitor is different

c. The voltage across each capacitor is same

d. Each capacitor stores a different charge

---

5. What is the frequency and type of modulation used in an IR Remote controls for TV? **(+1, -0.33)**

a. 108.1 kHz, FM

b. 38 kHz, PCM

c. 98 kHz, PM

d. 98.1 MHz, AM

---

6. If a JK FF toggles more than once during one clock cycle, it is called_ _ _ _ _ _ _ **(+1, -0.33)**

a. Bouncing

b. Racing

c. Pinging

d. Spiking

---

7. What is the size of internal data memory in an 8051 microcontroller? **(+1, -0.33)**

a. 2048 bytes

b. 1024 bytes

c. 256 bytes

d. 128 bytes

---

8. The ratio of root mean square value (R.M.S.) and the average value of a particular waveform is called _ _ _ _ _ _ _ _ _ _ of the wave. **(+1, -0.33)**

a. Mean value

b. Crest factor

c. Peak factor

d. Form factor

---

9. In the full-wave rectifier, relation between peak value and rms value is: **(+1, -0.33)**

a. $V_p = \sqrt{4}V_{rms}$

b. $V_p = \sqrt{3}V_{rms}$

c. $V_p = \sqrt{2}V_{rms}$

d. $V_p = \sqrt{1.2}V_{rms}$

---

10. Which of the following is NOT a function of the LED driver? **(+1, -0.33)**

a. Preventing damage against EMI

b. Preventing damage to LEDs by Regulating the forward voltage (VF)

c. Avoiding thermal runaway

d. Delivering a constant current to the LED

---

11. Identify the main reason why an Ammeter should have very low internal resistance (+1, -0.33)

a. It should provide damping

b. It should decrease the circuit resistance.

c. It should not affect the circuit resistance.

d. It should not burn

---

12. Which one of the following sensors produces a voltage output upon sensing temperature? (+1, -0.33)

a. RTD

b. Thermocouple

c. Strain Gauge

d. Thermostat

---

13. In computers, some area in the memory is reserved for high speed operations and storing frequently used instructions. What is the name of this type of memory? (+1, -0.33)

a. Flash

b. Cache

c. SRAM

d. Northbridge

---

14. In which type of network topology computers are connected to a centralise Hub/switch (+1, -0.33)

a. Star topology

b. Ring topology

c. Bus topology

d. Mesh topology

---

15. The carrier of an AM signal has power of 1,000 Watts. If the percentage of modulation is 80, what is the power in the upper sideband? (+1, -0.33)

a. 800 Watts

b. 160 Watts

c. 320 Watts

d. 640 Watts

---

16. Which of the following is not a type of optocoupler? (+1, -0.33)

a. Photo TRIAC type

b. Photoresistor type

c. Phototransistor type

d. Photo SCR type

---

17. The number of input lines in a common BCD to seven segment decoder is _ _ _ _ _. (+1, -0.33)

a. 8

b. 2

c. 16

d. 4

---

18. Which of the following modulation techniques uses two carriers? (+1, -0.33)

a. QAM

b. TDM

c. FSK

d. ASK

---

19. Which of the following is used in domestic fan speed control circuits? (+1, -0.33)

a. DIAC

b. TRIAC

c. SCS

d. SCR

---

20. For currents as high as 2,000 Amps, which of the following types of fuses is the best choice? (+1, -0.33)

a. LRC Fuse

b. HRC Fuse

c. Nichrome Wire Fuse

d. Glass Cartridge Fuse

---

21. Which of the following connectors is used for telephone/ modem interface? (+1, -0.33)

a. RJ45

b. RJ32

c. RJ67

d. RJ11

---

22. Which type of proximity sensor is not suitable of detecting 'Glass Bottles'? (+1, -0.33)

a. Photoelectric type

b. Inductive type

c. Capacitive type

d. Ultrasonic type

---

23. In which frequency band does a 2GHz signal lie? (+1, -0.33)

a. VHF

b. HF

c. UHF

d. EHF

---

24. How many dual-purpose ports are there in the 8051 microcontroller? **(+1, -0.33)**

a. 2

b. 3

c. 4

d. 1

---

25. What are the logic levels in case of TTL logic using +5V as V_{CC} ? **(+1, -0.33)**

a. 0 to 0.8 V for logic 0 and 2 V to VCC for logic 1

b. – 0.3 to 0.3 V for logic 0 and 2.8 v to VCC for logic 1

c. -0.1 to 0.6 V for logic 0 and 1.7 v to VCC for logic 1

d. 0 to 0.3 v for logic 0 and 0 V to VCC for logic 1

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26. _ _ _ _ _ _ is used to describe the information about the hue and saturation of a color. **(+1, -0.33)**

a. Phosphorescence

b. Sharpness

c. Chrominance

d. Luminance

---

27. The hexadecimal equivalent of the decimal number 4096 is _ _ _ _. (+1, -0.33)

a. 1000

b. F100

c. F0

d. 1F0

---

28. A PC consuming 100 Watts is to be operated on a UPS. The UPS uses a 12 Volts, 100 AH battery. Assuming unity PF, what is the backup time of this unit? (+1, -0.33)

a. 8 hours

b. 16 hours

c. 24 hours

d. 12 hours

---

29. The Octal equivalent of the hexadecimal number 100 is _ _ _ _ _. (+1, -0.33)

a. 400

b. 600

c. 300

d. 200

---

30. 180 Coulombs of charge passes in a given time “t” through a wire of 1 ohm when connected to a 3 V DC supply. Identify the value of “t” from the options given **(+1, -0.33)**

a. 1 Minute

b. 2 Minute

c. 1.5 Minute

d. 0.5 Minute

---

31. Optical Time domain Reflectometer is used to measure: **(+1, -0.33)**

a. Wavelength

b. Dispersion in optical fibre

c. Eye Pattern

d. Loss in optical Communication

---

32. Which among the following is NOT the function of an Operating System? **(+1, -0.33)**

a. File Management

b. Device Management

c. Data Analysis

d. Memory Management

---

33. If two 'equal' resistances are connected in parallel configuration, then the resultant resistance will be: (+1, -0.33)

a. Multiplication of both the resistances

b. Half of the resistance value

c. Double of the resistance value

d. Zero

---

34. By using AC coupling mode in a CRO _ _ _ _ _ _ _ _. (+1, -0.33)

a. any signal cannot be viewed on the display

b. only AC signal can be viewed on the display

c. only DC signal can be viewed on the display

d. both AC and DC signals can be viewed on the display

---

35. Identify the port shown in the image below. (+1, -0.33)

a. HDMI

b. DVI

c. MIDI

d. FireWire

---

36. The present state of the output of an SR flip flop is HIGH. If both its inputs become LOW, what would be the new state of the output? (+1, -0.33)

a. Unpredictable

b. LOW

c. Toggles

d. HIGH

---

37. Which of the following rectifiers needs a 'Centre tapped transformer'? (+1, -0.33)

a. Two-phase Full Wave Rectifier

b. Half Wave Rectifier

c. Full Wave Bridge Rectifier

d. Full Wave two-diode Rectifier

---

38. Power loss in a transformer is known as the _ _ _ _ _. (+1, -0.33)

a. Difference of current between the secondary and the primary coils.

b. Addition of power in the secondary and the primary coils.

c. difference of voltage between the secondary and the primary coils.

d. Difference of power between the primary and the secondary coils

---

39. What is the length of the antenna needed to a signal of 500 KHz frequency? (+1, -0.33)

a. 6 km

b. 150 m

c. 600 m

d. 1 km

---

40. What is the purpose of using bypass diodes in the series connected solar panels? **(+1, -0.33)**

a. Increasing the current through shaded cells

b. To increase the resistance of shaded cells

c. Protection of shaded cells

d. To redirect light for shaded cells

---

41. Which one of the gates mentioned below works as 'parity checker'? **(+1, -0.33)**

a. AND

b. Ex-OR

c. OR

d. NAND

---

42. The synchronous speed of an induction motor is 1,000 RPM. Find the percentage slip if its actual rotation speed is 980 RPM? **(+1, -0.33)**

a. 4

b. 8

c. 2

d. 20

---

43. When the LED lights need a range of voltages to operate, Which of the following drivers is best suited for the job? (+1, -0.33)

a. Constant frequency

b. Constant Voltage

c. Constant Impedance

d. Constant Current

---

44. The emitter of which of the below mentioned transistors has electrons as the majority carriers? (+1, -0.33)

a. N Channel

b. PNP

c. NPN

d. PNPN

---

45. The principle of magnetic attraction and repulsion works in: (+1, -0.33)

a. MI instruments

b. PMMC instruments.

c. Digital multimeter

d. CRO

---

46. Which frequency range is used for TV? **(+1, -0.33)**

a. HF

b. ULF

c. VLF

d. UHF

---

47. FET is a _ _ _ _ _ _. **(+1, -0.33)**

a. Current and voltage controlled device

b. Power controlled device

c. Voltage controlled device

d. Current controlled device

---

48. Which of the following is NOT a type of trigger in Digital storage Oscilloscope? **(+1, -0.33)**

a. Level

b. Pulse Width

c. Video

d. Edge

49. A stable multivibrator operating at 100 Hz has a discharge time 2 ms. Find the duty cycle of the circuit (+1, -0.33)

a. 10%

b. 20%

c. 80%

d. 50%

50. Push-pull amplifiers are_____. (+1, -0.33)

a. Class AB amplifiers

b. Class C amplifiers

c. Class B amplifiers

d. Class A amplifier

51. Online UPS requires (+1, -0.33)

a. Only battery

b. Both rectifier and inverter

c. Only rectifier

d. Only inverter

52. Which of the following is used with LED lamps to focus its entire lighting (+1, -0.33)

output in one direction?

a. Aluminum Channels

b. Aluminum Panels

c. Parabolized Aluminum Refractor

d. Parabolized Aluminum Reflector

---

53. Which one of the following can be used as a photo detector in Fiber Optic Communication? **(+1, -0.33)**

a. Tunnel diode

b. LED

c. PIN diode

d. LASER diode

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54. Based on which principle does a Moving Coil meter work? **(+1, -0.33)**

a. Faraday's Current law

b. Faraday's Voltage law

c. Ohm's law

d. Maxwell's law

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55. Identify the frequency of the crystal used for outgoing calls in mobile phones. **(+1, -0.33)**

a. 26 MHz

b. 99 MHz

c. 108 MHz

d. 5.5 MHz

---

56. Identify the main feature of power amplifiers from the options given below. (+1, -0.33)

a. They have voltage amplifiers in the preceding stage.

b. They cannot be operated without transformers.

c. Their output voltage is high.

d. Their output impedance is high.

---

57. When a Star Delta Starter is used with 3 – phase squirrel cage motors, in which sequence is the connection made? (+1, -0.33)

a. First Delta, then Star modes

b. First delta, then Star and again Delta modes

c. First Star, then Delta modes

d. First Star, then Delta and again Star mode

---

58. Ten cells, each of 2 volts emf and 1 ohm internal resistance are connected in series. What is the current flowing through a resistance of 10 ohms connected across this combination of cells? (+1, -0.33)

a. 1 A

b. 100 mA

c. 1 mA

d. 10 mA

---

59. Identify the WRONG statement from the options given below. (+1, -0.33)

a. In LED TV, the LEDs can be placed on the edges too.

b. Both LCD and LED TVs use an LCD screen for display.

c. LEDs are used for backlighting the LCD screen of LED TV.

d. CFLs are used for backlighting the LCD screen of LED TV

---

60. Which of the following statements is true for Bi Colour LEDs? (+1, -0.33)

a. Two different colour LEDs are connected in series in the reverse direction

b. Two different colour LEDs are connected in series in the same direction

c. Two different colour LEDs are connected in inverse parallel

d. A special dopant is used for producing two colours in on LED

---

61. In an Op Amp integrator circuit, what is done to, limit the gain at 'Low Frequencies'? (+1, -0.33)

a. A large resistor is connected in series with the input.

b. A large resistor is connected across the feedback capacitor.

c. A small capacitor is connected in series with the input.

d. A large capacitor is connected across the output.

---

62. The number of Flip Flops required for constructing a MOD 12 counter is_ _ _ _ _. **(+1, -0.33)**

a. 3

b. 6

c. 4

d. 5

---

63. An Op amp has Gain Bandwidth Product of 1 MHz. At what frequency will gain of this Op amp be equal to unity? Identify form the options given below. **(+1, -0.33)**

a. 100 kHz

b. 1000 kHz

c. 10 kHz

d. 10 MHz

---

64. The IC 74LS138 is a _ _ _ _. **(+1, -0.33)**

a. 8 bit adder

b. 8 line demultiplexer

c. 8 bit subtractor

d. 8 line multiplexer

---

65. Why is the transformer of an SMPS smaller in size when compared to a transformer in a Linear power Supply of similar rating? **(+1, -0.33)**

a. Because of smaller currents

b. Because of lower PF

c. Because of higher efficiency

d. Because of HF operation

---

66. TRIAC is similar to **(+1, -0.33)**

a. two SCR connected in series back to back

b. two diodes connected in parallel

c. two SCR connected in anti-parallel

d. two diodes connected in series back to back

---

67. The primary voltage of a transformer is 200 volts and the secondary voltage is 50 volts. If the number of turns in the secondary winding is 100, the number of turns in the primary is_ _ _ _ _. **(+1, -0.33)**

a. 400

b. 100

c. 200

d. 800

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68. Which system allows the entire bandwidth to be available to each user at the same time? **(+1, -0.33)**

a. CSMA

b. GSM

c. CDMA

d. FDMA

---

69. What is the peak to peak value of a sine waveform whose average value is 12.74 volts? **(+1, -0.33)**

a. 40 V

b. 30 V

c. 20 V

d. 10 V

---

70. Proximity sensors are used to _ _ _ _ _. **(+1, -0.33)**

a. Detect non-magnetic but conductive materials

b. Measure strain

c. Measure distance

d. Measure temperature

---

71. Which one of the following instructions is used to “Move Immediate Data to Register” in 8051? (+1, -0.33)

a. MOV direct, R_n

b. MOV R_n, #data

c. MOV R_n, direct

d. MOV A, R_n

---

72. Refractive Index of the medium is the ratio of _ _ _ _ _. (+1, -0.33)

a. Velocity of light in the medium to the Velocity of light in the vacuum

b. Velocity of light in water to the velocity of light in air

c. Velocity of light in the water to the velocity of light in the vacuum

d. Velocity of light in the vacuum to the velocity of light in the medium

---

73. Which one of the following circuits allows control of the SMPS output? (+1, -0.33)

a. LCL filter circuit

b. PWM circuit

c. EMI Filter circuit

d. LC filter circuit

---

74. In mobile phones, when a user puts the phone to his/her ears, the screen goes off. Which is the sensor used for this? (+1, -0.33)

a. Motion sensor

b. Proximity sensor

c. Vibration sensor

d. Temperature sensor

---

75. In the voltage amplifier _ _ _ _ _ _ _ _. **(+1, -0.33)**

a. Output voltage is zero.

b. Output voltage is lower than the input voltage.

c. Output voltage is equal to the input voltage.

d. Output voltage is larger than the input voltage.

Answers

1. Answer: b

Explanation:

Operating torque:

In moving iron instruments, the deflecting torque is given by

$T_d = \frac{1}{2} I^2 \frac{dL}{d\theta}$

I is the operating current in Ampere

L is the inductance in Henry

θ is the deflection angle in radians

⭐ **Important Points**

The moving iron instruments are applicable to both DC and AC circuits:

- Whatever the direction of the current in the coil of the instrument, the iron vanes are so magnetized that there is always a force of attraction in the attraction type and repulsion in the repulsion type of instruments.
- Thus, moving iron instruments are unpolarised instruments i.e. they are independent of the direction in which the current passes. Therefore, the instruments can be used on both ac and dc.

---

2. Answer: c

Explanation:

- The **Optical Time Domain Reflectometer (OTDR) is useful for testing the integrity of fiber optic cables** (OFC).
- It can verify **splice loss, measure the length, and find faults.**

- The OTDR is also commonly used to create a "picture" of fiber optic cable when it is newly installed.
- Later, comparisons can be made between the original trace and a second trace taken if problems arise.
- The OTDR consists of a high power laser transmitter that sends a pulse of light down the fiber.
- Back-scattered light and reflected light returns to the OTDR through the fiber and is directed to a sensitive receiver through a coupler in the OTDR front end.
- For each measurement, the OTDR sends out a very high power pulse and measures the light coming back over time.

---

3. **Answer: c**

Explanation:

LCR meter:

- **An LCR meter is electronic test equipment used to measure the inductance (L), capacitance (C), and resistance (R) of an electronic component.**
- It actually measures impedance internally and converted for a display to the corresponding capacitance or inductance value.
- It **gives accurate readings** if the inductor or capacitor device under test does **not have a significant resistive component** of impedance.
- An LCR meter can also be **used to measure the inductance variation** with respect to the rotor position in permanent magnet machines.

Operation:

Generally, the device under test is subjected to **an AC voltage source** . The meter **measures the voltage across and the current** through the device under test. From the **ratio** of these the meter can determine the **magnitude of the impedance** . The phase angle between the voltage and current is also measured in more advanced instruments, in combination with the impedance the equivalent capacitance or inductance, and resistance of the device under test can be calculated and displayed.

Important points:

- The **automatic bridge balance method** is is a circuit design that is used in the LCR meter.
- These can be easily operated, it can measure passive components with minimal error.
- By the use of an LCR meter, we can also measure parameters like **dissipation factor, quality factor, conductance, susceptance.**

---

4. **Answer: a**

Explanation:

- The device that stores electrical energy in an electric field is called a capacitor .
- The capacity of a capacitor to store electric charge is called capacitance.

Capacitor in series combination:

- When two or more capacitors are connected in series then they will have the same electric charge on each and hence same current will flow through them.
- The voltage across each capacitor is dependent on the capacitor value.

Capacitor s in parallel combination:

- The charge of each capacitor is different and the current flowing through each capacitor in the given time are also different and depend on the value of the capacitor .
- The voltage across each capacitor is the same.

---

5. **Answer: b**

Explanation:

IR Remote controls for TV:

- Today's modern remote controls work by modulating the output from an infra-red LED.
- The circuit board consists of circuitry to sense the connections or detect the button being pressed and produces the signal in Morse code form which is amplified by the transistors and then given to IR LED.
- Pulse code modulation technique is used.
- The reason for modulation is to separate the remote IR range from the IR light emitted by other bodies in the vicinity.
- A series of pulses of varying width is sent to a gate that turns on or off, the modulator which is usually 38 kHz.

---

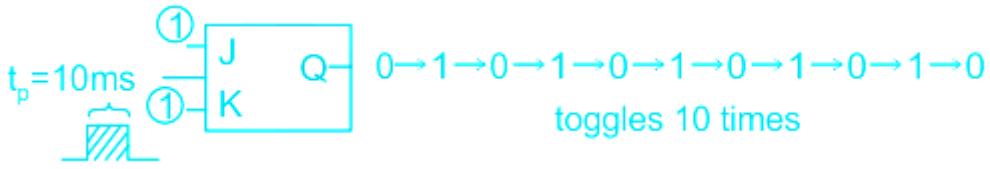
6. Answer: b

Explanation:

If a JK FF toggles more than once during one clock cycle, it is called **RACING.**

Race around condition (RAC)

- Race around condition occurs only in level-triggered flip flop
- Level triggered is transparent
- Even though input is constant, output continuously toggles. Changes for some time continuously



RAC is when J = 1 and K = 1 [flip flop in toggling mode] and t p > t ff

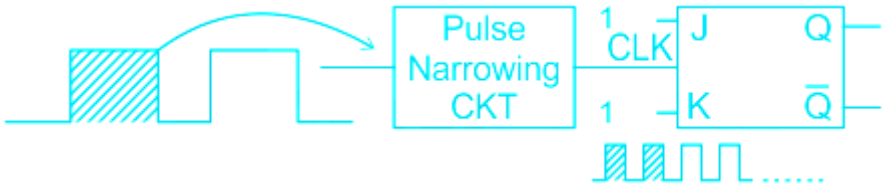
⭐ Important Points

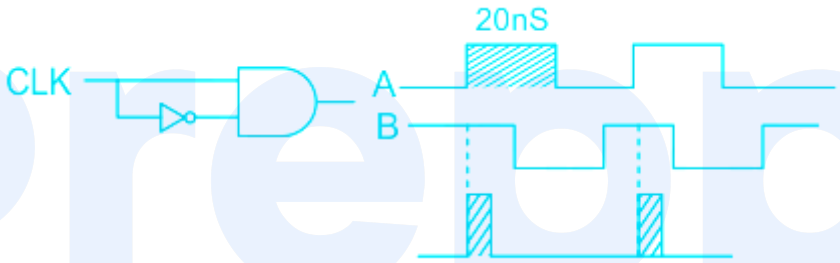
How to avoid Race Around Condition

Before the next clock pulse comes conversion should be complete, if we use edge-triggered flip flop then cost increases.

1) Choose flip flop propagation delay such that $tp \leq t\,ff \leq T$. Where $t\,p, t\,ff, T$ are pulse width, flip flop propagation delay and Time duration of flipflop

2) We can use pulse narrowing circuits





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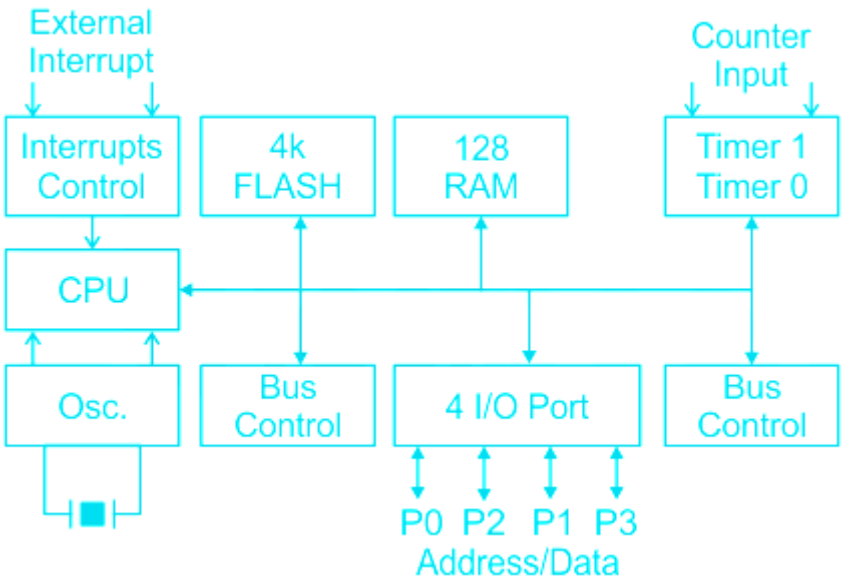
7. **Answer: d**

Explanation:

- 8051 is an 8-bit microcontroller built with 40 pins DIP (dual inline package).
- 8051 has internal RAM (128 Bytes) and ROM (4K Bytes).
- Of the 128-byte internal RAM, only 16 bytes are bit-addressable. The rest must be accessed in byte format.

Notes :

The Block Diagram of an 8051 microcontroller is as shown:



In an 8051 microcontroller,

- Internal RAM (data memory) - 128 bytes
- Internal memory (code memory) - 4 kB (ROM)
- Timer/counter - 2
- No. of interrupt - 5
- I/O pins - 32
- Serial port - 1

8. Answer: d

Explanation:

The ratio of RMS value to the average value is known as the form factor.

$$Form\ factor = \frac{rms\ value}{average\ value}$$

Important Point :

The ratio of the maximum value (peak value) to RMS value is known as the peak factor or crest factor.

$$Peak\ factor = \frac{maximum\ value}{rms\ value}$$

9. **Answer: c**

Explanation:

The RMS or the effective value of a waveform f(t) is given by:
\({f_{rms}} = \sqrt {\frac{1}{T}\mathop \smallint \limits_0^T {f^2}\left(t \right)dt}\)

Application:

The relation between the peak value and rms value of the waveform is given as:

$V_p = \sqrt{2}V_{rms}$

⭐ **Important Points**

The relation between the peak value and the average value for a half and full-wave rectifier is:

$V_{avg} = \frac{V_m}{\pi}$ for half-wave rectifier

$V_{avg} = \frac{2V_m}{\pi}$ for full-wave rectifier

10. **Answer: a**

Explanation:

An **LED driver** is a self-contained power supply that regulates the power required for an **LED** or array of **LEDs.**

LED drivers applications:

1) The change in forward voltage of LED with the change in temperature can cause the LED to burn out, this is also known as **Thermal Runaway** .

2) LED drivers prevents damage to LEDs as the constant current LED driver compensates for the changes in the **forward voltage** while delivering a **constant current** to the LED.

3) Thus LED drivers, convert higher voltage, alternating current to low voltage, direct current, and

4) It keeps the voltage or current flowing through the circuit at its rated level.

---

11. **Answer: c**

Explanation:

- For reading a higher range of current ammeter shunt is used.
- When high current is to be measured most of the current passed through a low resistance called a shunt
- A high value of internal resistance will vary the current considerably in an Ammeter.
- The internal resistance of a milli-ammeter must be very low for minimum effect on the current in the circuit

---

12. **Answer: b**

Explanation:

Thermocouple:

- The thermocouple is an electrical device containing junctions of two dissimilar metal joints. It is used as temperature sensors.
- It works on the principle of the thermoelectric effect or t he **Seebeck effect which means**which states that the temperature difference between two dissimilar electric conductors produces a voltage difference between them.
- This potential difference is used to measure temperatures.

⭐ Important Points

- Thermocouple types of instruments can be used for dc and ac applications.
- They can be used for measurements of currents and voltages at high frequencies.
- These instruments are very accurate well above a frequency of 50 MHz.

---

13. **Answer: b**

Explanation:

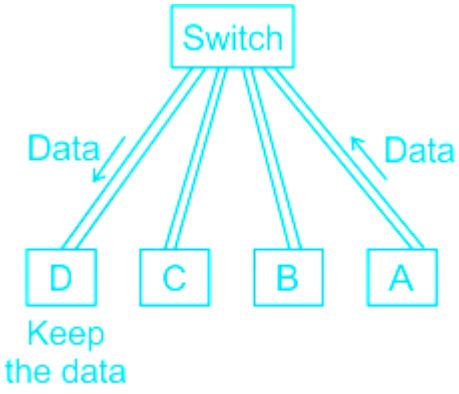
- A cache memory is used by the central processing unit of a computer to reduce the average cost time or energy to access data from the main memory.
- Cache memory is generally positioned between CPU and main memory.
- Cache memory has a separate bus for data transfer.
- Cache memory is very small in size as compared to the main memory.
- Cache stores data for temporary use.
- Cache can access more quickly than a regular RAM.
- The basic purpose of cache memory is to store program instructions that are frequently re-referenced by software during operation.

---

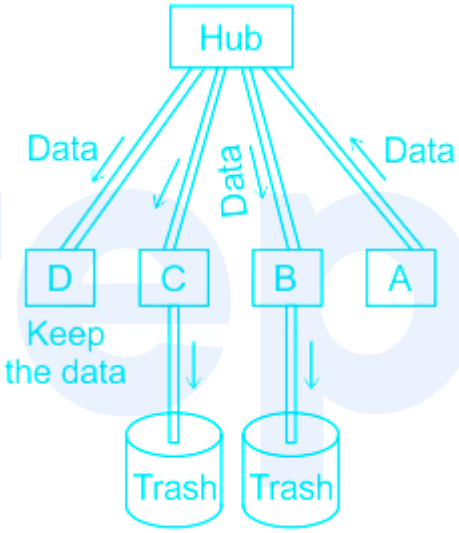
14. **Answer: a**

Explanation:

- Star networks are one of the most common computer network topologies.
- Hub and switch is the central device in star topology .
- In its simplest form, a star network consists of one central node, typically a switch or hub, which acts as a conduit to transmit messages.
- In star topology , every node is connected to a central node.
- The switch is the server and the peripherals are the clients.



Switch in star topology



Hub in star topology

15. **Answer: b**

Explanation:

Concept:

The total transmitted power for an AM system is given by:

$P_t = P_c\left(1 + \frac{\mu^2}{2}\right)$

P c = Carrier Power

μ = Modulation Index

The above expression can be expanded to get:

$P_t = P_c + P_c\frac{\mu^2}{2}$

The total power is the sum of the carrier power and the sideband power, i.e.

$P_s = P_c\frac{\mu^2}{2}$

Calculation :

Given: P_c = 1000 W and μ = 0.8.

We can write:

$P_s = P_c\frac{\mu^2}{2}$

$= 1000 \times \frac{0.8^2}{2}$

$P_s = 320\ W$

The total sideband power = 320 W

power in upper sideband + power in lower side band = 320 W

power in upper sideband = power in lower sideband = 160 W

---

16. Answer: b

Explanation:

Opto-coupler:

Opto-coupler is an electronic component that transfers electrical signals between two isolated circuits. It also called opto-isolator, photocoupler or optical isolator.

In low voltage or highly noise-sensitive circuits, the optocoupler is used to isolate circuitry to prevent electrical collision chances or to exclude unwanted noises.

Types of optocoupler:

There are many different types of optocouplers are available based on their needs and switching capabilities. Depending on the use there are mainly four types of optocouplers are available.

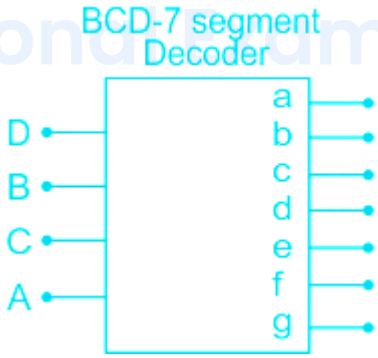
- Opto-coupler which use Photo Transistor
- Opto-coupler which use Photo Darlington Transistor
- Opto-coupler which use Photo TRIAC
- Opto-coupler which use Photo SCR

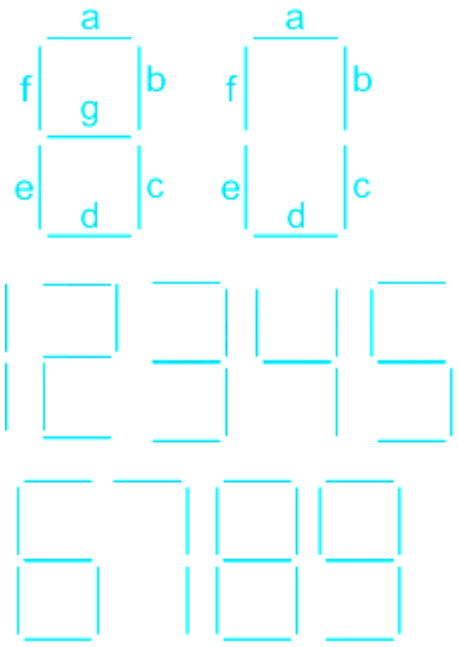
---

17. **Answer: d**

Explanation:

- In BCD to 7-segment Decoder, the outputs of a digital circuit are often displayed as decimal digits.
- BCD to 7-segment decoder is a combinational circuit that converts a BCD number into signals that are required for the display of the value of that number on a seven-segment display.
- The number of input lines is 4.





Notes:

- The decoder outputs are (a, b, c, d, e, f, g)
- For the display of the digit 0, segments a, b, c, d, e, f will be lit as shown above.

A truth table can be formed for all digits from 0 to 9.

Digit	D	C	B	A	a	b	c	d	c	f	g	Hex equivalent
0	0	0	0	0	1	1	1	1	1	1	0	7E
1	0	0	0	1	0	1	1	0	0	0	0	30
2	0	0	1	0	1	1	0	1	1	0	1	6D
3	0	0	1	1	1	1	1	1	0	0	1	79
4	0	1	0	0	0	1	1	0	0	1	1	33
5	0	1	0	1	1	0	1	1	0	1	1	5B
6	0	1	1	0	1	0	1	1	1	1	1	5 F
7	0	1	1	1	1	1	1	0	0	0	0	70
8	1	0	0	0	1	1	1	1	1	1	1	7F
9	1	0	0	1	1	1	1	1	0	1	1	7B

18. **Answer: a**

Explanation:

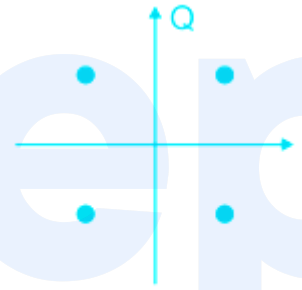
QAM uses two carrier signals which are in quadrature

Quadrature here means out phase by 90°

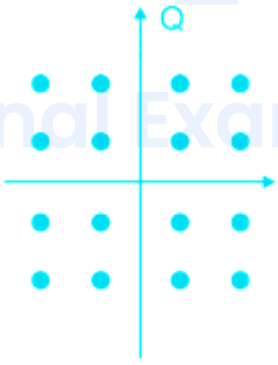
B-ASK, B-PSK all use a single carrier.

B-FSK use two carriers of very high-frequency carriers which are closely related

The constellation diagram for QAM is shown in the figure



Constellation 4-QAM



Constellation 16-QAM

⭐ Important Points

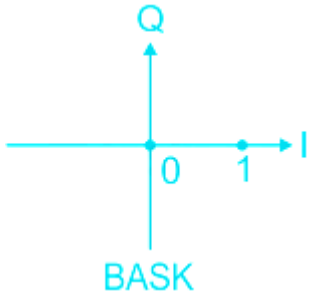
ASK(Amplitude Shift Keying) :

In ASK (Amplitude shift keying) binary '1' is represented with the presence of a carrier and binary '0' is represented with the absence of a carrier:

For binary '1' → $S_1(t) = A\cos 2\pi f_c t$

For binary '0' → S 2 (t) = 0

The Constellation Diagram Representation is as shown:



where 'I' is the in-phase Component and 'Q' is the Quadrature phase .

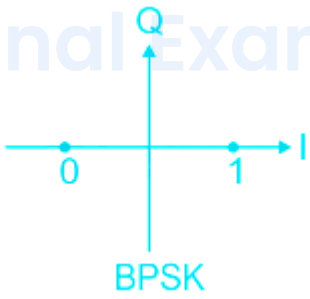
PSK(Phase Shift Keying) :

In PSK (phase shift keying) binary 1 is represented with a carrier signal and binary O is represented with 180° phase shift of a carrier

For binary '1' → S 1 (A) = Acos 2π f ct

For binary '0' → S 2 (t) = A cos (2πf ct + 180°) = - A cos 2π f ct

The Constellation Diagram Representation is as shown:

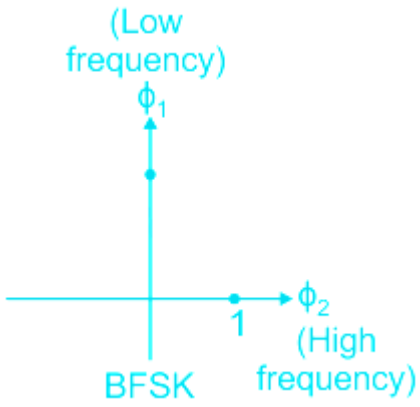


FSK (Frequency Shift Keying) :

In FSK (Frequency Shift Keying) binary 1 is represented with a high-frequency carrier signal and binary 0 is represented with a low-frequency carrier, i.e. In FSK, the carrier frequency is switched between 2 extremes.

For binary '1' → S 1 (A) = Acos 2π f Ht

For binary '0' → S 2 (t) = A cos 2π f Lt . The constellation diagram is as shown:



19. **Answer: b**

Explanation:

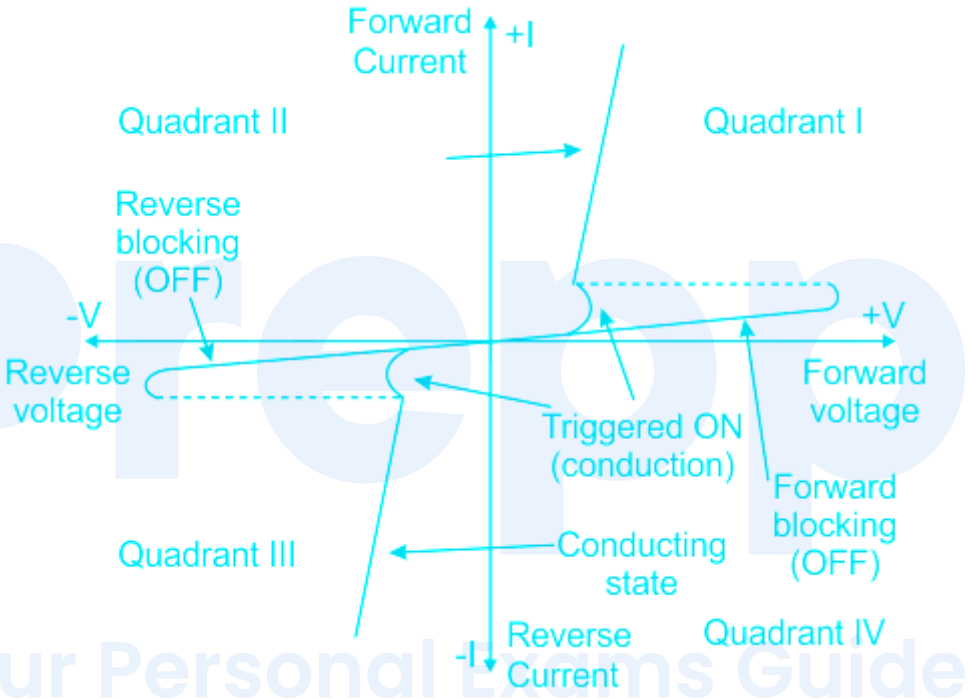
Explanation:

- TRIAC is used in the domestic fan speed control circuits.
- In the TRIAC-based electronic fan regulator circuit, the main components used are a resistor, capacitor, DIAC, and TRIAC.
- TRIAC is directly used to control the speed by holding and releasing the current flow.

TRIAC:

- The TRIAC is a 3-terminal semiconductor device and may be considered equivalent to two SCRs connected in antiparallel.
- TRIAC are bidirectional devices.
- It is ideal for operation utilizing AC power for switching purposes (operated at power frequency)
- It can control current flow for both halves in an alternating current cycle.
- Triac Used in ac voltage regulators, Cycloconverters, inverter

The V-I characteristics are shown below.



Applications:

- Lighting control - especially domestic dimmers.
- Control of fans and small motors.
- Electronic switches for general AC switching and control

⭐ Important Points

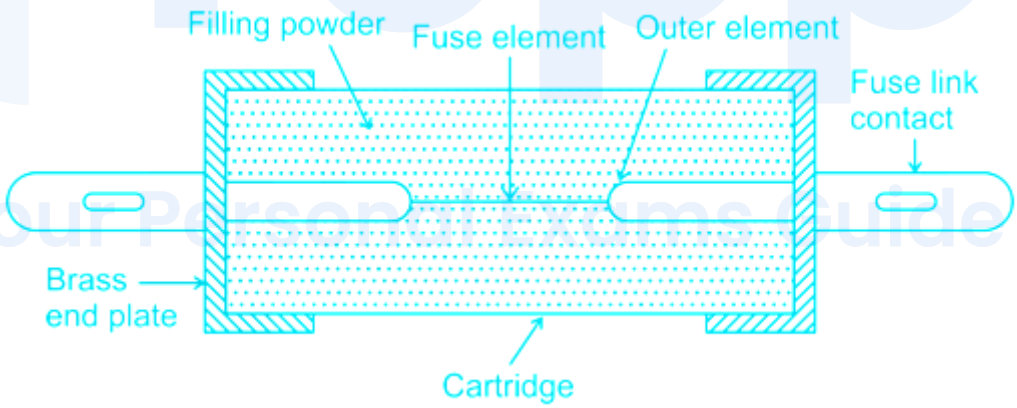
- TRIAC (Triode for AC) is a semiconductor device widely used in power control and switching applications.
- It finds applications in switching, phase control, chopper designs, brilliance control in lamps, speed control of motors, etc.

20. **Answer: b**

Explanation:

HRC) High Rupturing Capacity fuse :

- It consists of a heat-resisting ceramic body having metal end-caps to which is welded silver current-carrying element
- The space within the body surrounding the element is completely packed with a filling powder
- The filling material may be chalk, plaster of paris, quartz or marble dust and acts as an arc quenching and cooling medium
- Under normal load conditions, the fuse element is at a temperature below its melting point. Therefore, it carries the normal current without overheating.
- When a fault occurs, the current increases and the fuse element melts before the fault current reaches its first peak. Hence it is used for overcurrent protection.



Important Point:

Advantages of HRC fuse:

- They can clear high as well as low fault currents
- They do not deteriorate with age
- They have a high speed of operation
- They provide reliable discrimination
- They require no maintenance

- They are cheaper than other circuit interrupting devices of equal breaking capacity
- They permit consistent performance

Disadvantages of HRC fuse:

- They must be replaced after each operation
- The heat produced by the arc may affect the associated switches.

The fuse rating of various types of fuses is

Type of fuse	Fuse Rating
Kit-kat fuse	5A to 3000A
Cartridge fuse	2A to 60A
HRC fuse	30A to 1000A
D-type fuse	100mA to 10A

---

21. Answer: d

Explanation:

A **registered jack** (**RJ**) is a standardized telecommunication network interface for connecting voice and data equipment to a service provided by a local exchange carrier or long-distance carrier .

For example, **RJ11**, **RJ14**, and **RJ25** are the most commonly used interfaces for telephone connections for one, two, and three-line service, respectively.

RJ45 is a type of **connector** commonly used for Ethernet networking.

---

22. Answer: b

Explanation:

Proximity sensor:

- It is a non-contact **sensor** that detects the presence of an object (often referred to as the "target") when the target enters the sensor's field.
- Depending on the type of proximity sensor, sound, light, infrared radiation (IR), or electromagnetic fields may be utilized by the sensor to detect a target.
- Proximity sensors are used in phones, recycling plants, self-driving cars, anti-aircraft systems, and assembly lines.

The most popularly used proximity sensors are the Inductive and Capacitive type proximity sensor.

Inductive proximity sensor:

- An inductive proximity sensor can only detect metal targets.
- This is because the sensor utilizes an electromagnetic field.
- When a metal target enters the electromagnetic field, the inductive characteristics of the metal change the field's properties
- Thereby alerting the proximity sensor of the presence of a metallic target.
- Depending on how inductive the metal is, the target can be detected at either a greater or shorter distance.
- So, it 'cannot' be used for the detection of glass bottles.

Capacitive Proximity sensor:

- Capacitive proximity sensors, on the other hand, are not limited to metallic targets.

- These proximity sensors are capable of detecting anything that can carry an electrical charge.
- Capacitive sensors are **commonly used in liquid-level detection**.
- Possible targets for capacitive sensors include but are but not limited to: glass, plastic, water, wood, metals, and a myriad of targets of other materials.
- **So, it can be used for the detection of glass bottles.**

Photoelectric type sensor:

- There are two main types of photoelectric proximity sensors: reflective and through-beam.
- **Reflective proximity sensors** detect objects when the light emitted from the sensor is reflected back at the photoelectric receiver.
- **Through-beam sensors** detect targets when the target breaks the beam of light between the sensor's emitter and receiver.
- Used to discover the distance, absence, or presence of an object by using a light transmitter, often infrared, and a **photoelectric** receiver.
- They are largely **used** in industrial manufacturing.
- So, it can be used for the detection of glass bottles.

Ultrasonic type sensor:

- It measures the distance of a target object by emitting ultrasonic sound waves and converts the reflected sound into an electrical signal.
- Ultrasonic waves travel faster than the speed of audible sound (i.e. the sound that humans can hear).
- Ultrasonic sensors have two main components:
  The transmitter (which emits the sound using piezoelectric crystals) and
  The receiver (which encounters the sound after it has traveled to and from the target).
- They can be found in automobile self-parking technology and anti-collision safety systems.
- Ultrasonic sensors are also used in robotic obstacle detection systems, as well as manufacturing technology.
- So, it can be used for the detection of glass bottles.

23. **Answer: c**

Explanation:

The frequency spectrum for the complete range is:

NAME	FREQUENCY RANGE
Very low frequency (VLF)	0.003 MHz – 0.03 MHz
Low frequency (LF)	0.03 MHz – 0.3 MHz
Medium frequency (MF)	0.3 MHz – 3 MHz
High frequency (HF)	3 MHz – 30 MHz
Very High frequency (VHF)	30 MHz – 300 MHz
Ultra-High Frequency (UHF)	300 MHz – 3 GHz
Super-High Frequency **(SHF)**	3 GHz – 30 GHz
Extra-High Frequency (EHF)	30 GHz – 300 GHz

⭐ **Important Points**

The microwave spectrum is usually defined as a range of frequencies ranging from 1 GHz to over 300 GHz.

This range has been divided into a number of frequency bands, each represented by a letter.
The commonly used microwave frequency spectrum is as shown:

BAND	FREQUENCY RANGE (GHz)
L - Band	1 to 2 GHz
S-Band	2 to 4 GHz
C - Band	4 to 8 GHz
X - Band	8 to 10 GHz
Ku - Band	12 to 18 GHz
K - Band	18 to 26.5 GHz
Ka-Band	26.5 to 40 GHz

---

24. Answer: b

Explanation:

Ports in 8051:

- There are 4 ports in 8051 IC (Port 0, Port 1, Port 2 and Port 3); 32 pins function as I/O port lines and 24 of these lines are dual-purpose (P0, P1, P3).
- Each can operate as I/O, or as a control line or part of the address or data bus.

- Eight lines in each port can be used in interfacing to parallel devices like printers, DAC, etc., or each line the port can be used in interfacing to single bit devices like LED's, switches, transistors, solenoid, motors, and loudspeakers.

Important:

In an 8051 microcontroller,

- Internal RAM (data memory) - 128 bytes
- Internal memory (code memory) - 4 kB (ROM)
- Timer/counter - 2
- No. of interrupt - 5
- I/O pins - 32
- Serial port - 1

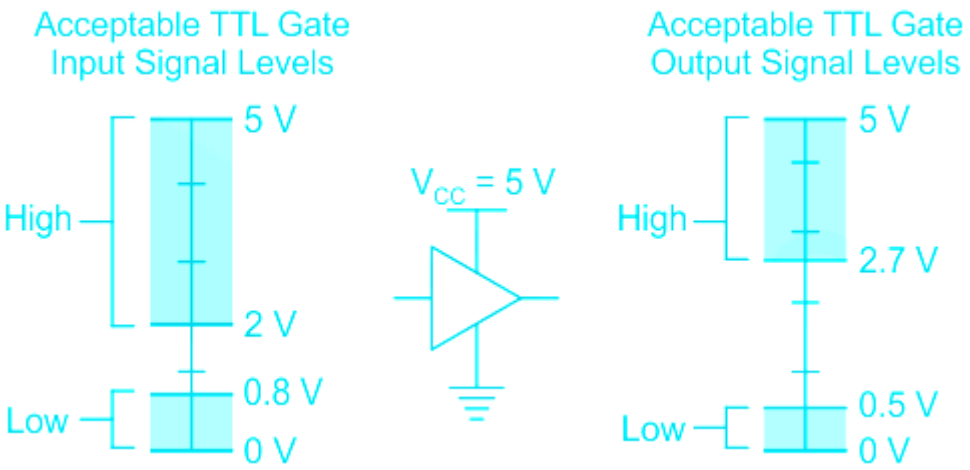
---

25. Answer: a

Explanation:

TTL (Transistor-Transistor Logic):

- A TTL input signal is defined as " low " when between 0 V and 0.8 V with respect to the ground terminal.
- A TTL input signal is defined as " high " when between 2 V and 5 V.
- if a voltage signal ranging between 0.8 V and 2.0 V is sent into the input of a TTL gate, there is no certain response from the gate and therefore it is considered "uncertain" (precise logic levels vary slightly between sub-types and by temperature).

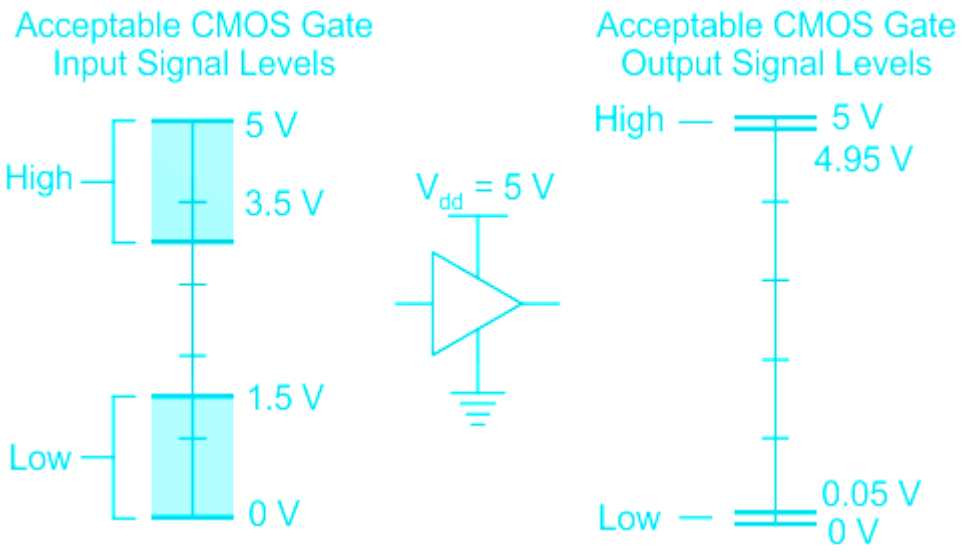


- TTL outputs are typically restricted to narrower limits of between 0.0 V and 0.4 V for a "low".
- TTL outputs are typically restricted to narrower limits of between 2.4 V and 5 V for a "high", providing at least 0.4 V of noise immunity .

⭐ Important Points

CMOS:

- For a CMOS gate operating at a power supply voltage of 5 volts,
- The acceptable input signal voltages range from 0 volts to 1.5 volts for a " low " logic state and 3.5 volts to 5 volts for a " high " logic state.
- Acceptable output signal voltages range from 0 volts to 0.05 volts for a " low " logic state, and 4.95 volts to 5 volts for a " high " logic state:



Specifications	TTL	ECL	CMOS
FAN IN	12-14	> 10	> 10
FAN OUT	10	25	50
power dissipation (mW)	10	75	0.001
Noise margin	0.5	0.16(least)	1.5 (highest)
Propagation delay(ns)	10	>3	15
Noise immunity	very good	good	excellent

---

26. Answer: c

Explanation:

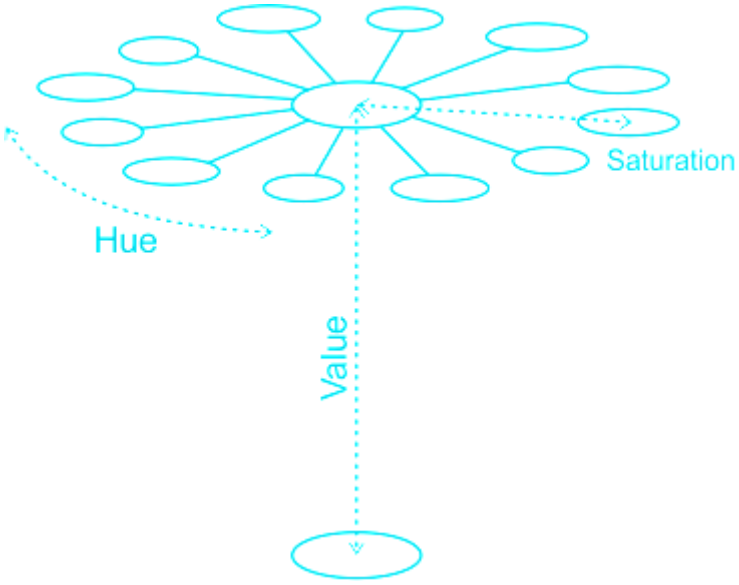
Hue and saturation are taken together are called chromaticity and therefore, a **color** may be characterized by its brightness and chromaticity.

Color consists of three main integral parts:

1. Hue: defined technically (in the CIECAM02 model) as "the degree to which a stimulus can be described as similar to or different from stimuli that are described as red, orange, yellow, green, blue, purple".

2. Value: the relative degree of black or white mixed with a given hue.

3. Saturation: Saturation is also referred to as “intensity” and “chroma.” It refers to the dominance of hue in the color. 100% saturation means there’s no addition of gray to the hue. The color is completely pure.



---

27. **Answer: a**

Explanation:

Concept:

- To convert a decimal number system to hexadecimal, we follow the successive division approach i.e. we divide the decimal number by 16 and note down the remainder.
- Each remainder is then expressed in hexadecimal.

Calculation:

16	4096	
16	256	0
16	16	0
	1	0

So, The hexadecimal equivalent of decimal number 4096 is 1000.

---

28. **Answer: d**

Explanation:

Concept:

The capacity of the battery is represented in terms of Amp-hour.

The **capacity of battery = current delivered × backup time**

Power consumption is given by

P = V I cos ϕ

Where,

V = Voltage

I = Current delivered

cos ϕ =Power factor

Calculation:

Given that, V = 12 volts, cos ϕ = 1, P = 100 W

capacity of battery = 100 AH

∴ I = 100 / 12

Now backup time can be calculated as

Backup time = 100 / (100 /12)

Backup time = 100 hours

---

29. **Answer: a**

Explanation:

The given hexadecimal number is: 100

To convert the given Hexadecimal number, first, we need to convert it into binary and then into octal .

Hexadecimal to binary: 0001 0000 0000

Binary to octal: To convert a binary number into octal, we need to make a group of three digits from right to left before the decimal pointer and left to right after the decimal pointer.

= 000 100 000 000

= 0400 = 400

---

30. **Answer: a**

Explanation:

Concept:

Current is defined as charge flowing through a wall in 1 sec.

$I = \frac{Q}{t}$

By ohm's law we know,

$V = IR$

Application:

$V = \frac{Q}{t}R$

$t = \frac{Q}{V}R$

$= \frac{180}{3} = 60\ s$

= 1 minute

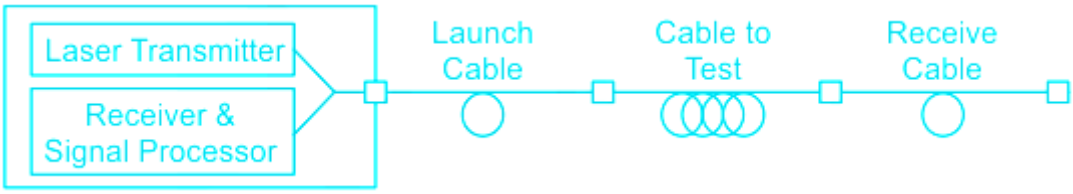
---

31. Answer: d

Explanation:

Concept:

- An **optical time-domain reflectometer** (**OTDR**) is an optoelectronic instrument used to characterize an optical fiber .
- The Optical Time Domain Reflectometer (OTDR) is useful for testing the integrity of fiber optic cables.
- OTDR is used to verify splice loss, find faults, and measure the length of optical communication.
- The instrument emits short laser **pulses**, e.g. with **pulse durations** of some tens of nanoseconds and **peak power** of a few hundred milliwatts, as can be obtained with a single-mode **laser diode .**
- The pulses are injected through a launch **cable**into the tested optical **fiber** .
- Any reflected light is extracted with a directional **fiber coupler** and sent to a fast and sensitive **photodetector** .
- The photodetector allows for the time-resolved measurement of the reflected **optical power** and thus of the **return loss .**
- One can find the propagation losses and also find whether the loss coefficient is constant along with the fire or changes locally.



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32. Answer: c

Explanation:

Operating System:

An operating system is a program that acts as an interface between the user and the computer hardware and controls the execution of all kinds of programs.

The following are some of the important functions of an operating System:

- **Memory Management.**
- Processor Management.
- **Device Management.**
- **File Management.**
- Security.
- Control over system performance.
- Error detecting aids.
- Coordination between other software and users.

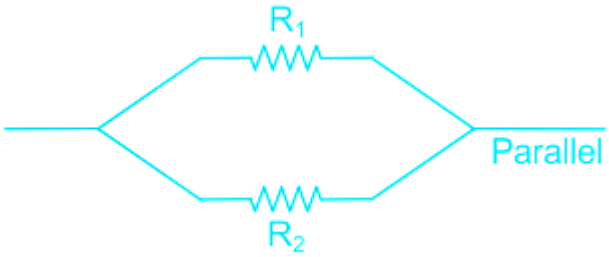
---

33. Answer: b

Explanation:

Concept:

When the terminals of two or more resistances are connected at the same two points and the potential difference across them is equal then it is called resistances in parallel.



The net resistance/equivalent resistance(R) of resistances in parallel is given by:

$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$

Application:

Given:

$R_1 = R_2 = R$

The equivalent resistance is given as:

$\frac{1}{R_{eq}} = \frac{1}{R} + \frac{1}{R}$

$R_{eq} = \frac{R}{2}$

---

34. Answer: b

Explanation:

Y-input connects the input signal to the vertical amplifier through the AC-DC-GND coupling switch.

AC-DC-GND coupling switch selects coupling to the vertical amplifier.

- In DC mode, it directly couples the signal to the input; only DC signal can be viewed on the display
- In AC mode, it couples the signal to the input through a 0.1 MF, 400-V capacitor; only AC signal can be viewed on the display
- In GND position, the input to the attenuator is grounded, whereas the Y-input is isolated; any signal cannot be viewed on the display

---

35. Answer: a

Explanation:

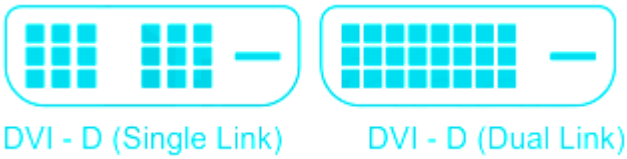
HDMI

- HDMI stands for High Definition Multimedia Interface.

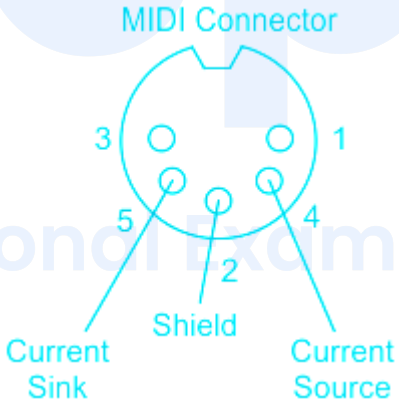
- It is a type of port that is used as an interface between computers and other output devices like TVs, projectors or digital monitor.
- HDMI is one of the most widely used ports for multimedia interfacing after the VGA (Video Graphics Array) port.

⭐ Important Points

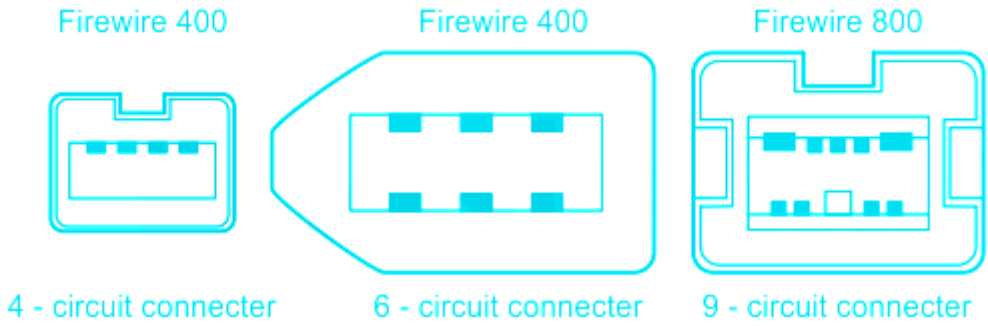
DVI cable : Digital Visual Interface (**DVI**) is a video display interface used to connect a video source, such as a video display controller, to a display device, such as a computer monitor.



MIDI cable: MIDI Cable is expansively used for covering and defending the wires in the residences and commercial buildings.

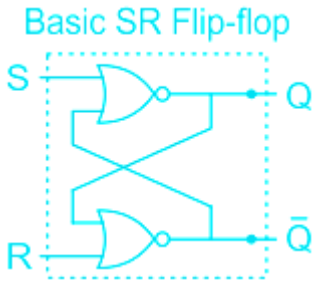


FireWire cable: It connects speed-critical audio/visual peripherals and multimedia devices to the computer.



36. **Answer: d**

Explanation:



The implementation of JK flip flop from SR latch is shown.

The truth table for SR flip flop is given as

S	R	Q n + 1
0	0	Q n
0	1	0
1	0	1
1	1	indeterminate

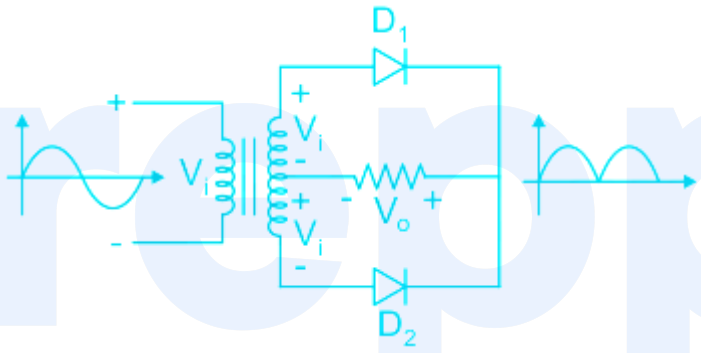
From the truth-table, we can see if the two inputs S and R are 0 0, then the output remains in the previous state. So, if Q_n= High then Q_{n+1} = High

37. **Answer: d**

Explanation:

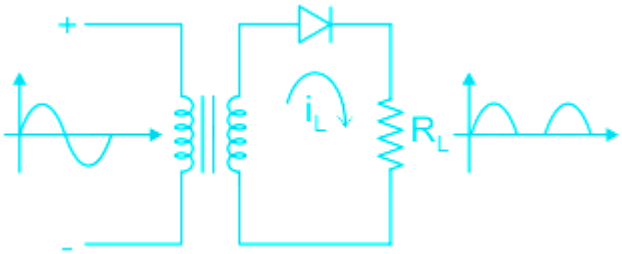
Concept:

- A two diode circuit is able to provide full-wave rectification when used with a centre tapped transformer.
- In the case of centre-tap full-wave rectifier, only two diodes are used and are connected to the opposite ends of a center-tapped secondary transformer as shown in the figure below.
- The centre-tap is usually considered as the ground point or the zero voltage reference point.

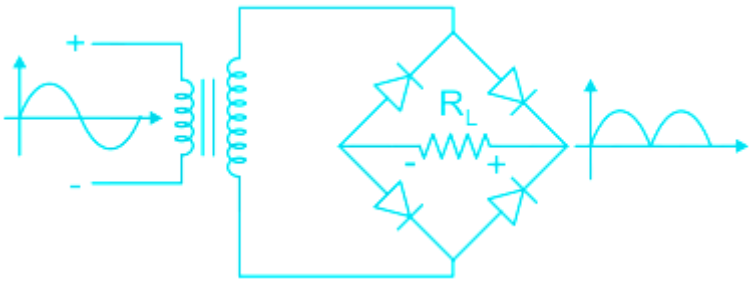


⭐ Important Points

1. Half-wave rectifier.



2. Full-wave bridge rectifier:



38. **Answer: d**

Explanation:

Loss in Transformer:

- A transformer is a static device that converts electrical power from one circuit to another without changing its frequency .
- Transformers are most commonly used to increase (step-up) or decrease (step down) voltage levels between circuits.
- Transformer energy losses are mainly due to winding and core losses .
- For an ideal transformer, the value of input power is equal to the output power.
- But in the case of the practical transformer, the power loss occurs by means of core loss and winding loss.
- **This power loss is the difference of input primary power to output secondary power.**

39. **Answer: b**

Explanation:

Concept:

- For transmitting a signal , we need an antenna or an aerial.
- This antenna should have a size comparable to the wavelength of the signal (at least 1/4 in dimension) so that the antenna properly senses the time variation of the signal.
- For example, if we have an electromagnetic wave of frequency (f) 20 kHz, the wavelength (λ) is 15 km

Calculation:

Given that,

Electromagnetic waves of frequency 500 kHz is transmitted, i.e.,

f = 500 kHz

Hence the minimum length of antenna = $\frac{\lambda}{4} = \frac{c}{4f}$ $(\because c = f\lambda)$

Here c is the velocity of light, λ is wavelength and f are the frequency of the wave

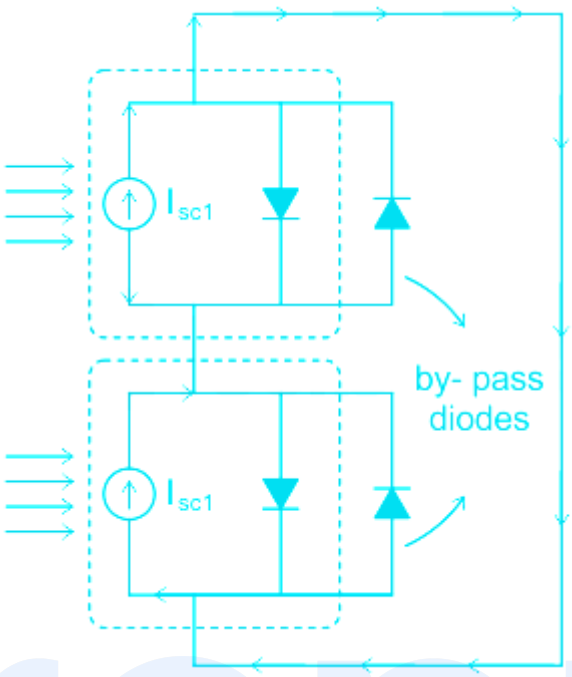
∴ length of antenna = $\frac{3\times10^8}{4\times5\times10^5} = 150\ m$

---

40. Answer: c

Explanation:

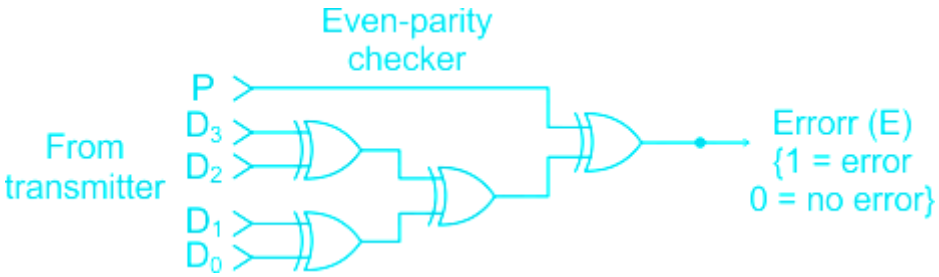
- The use of bypass diodes allows a series (called a string) of connected cells or panels to continue supplying power at a reduced voltage rather than no power at all.
- Bypass diodes are connected in reverse bias between solar cells (or panel) positive and negative output terminals and have no effect on its output.
- The bypass diodes' function is to eliminate the hot-spot phenomena which can damage the PV cells and even cause a fire if the light hitting the surface of the PV cells in a module is not uniform.
- Thus it enables the PV modules to operate with high reliability throughout their lifetime.



41. **Answer: b**

Explanation:

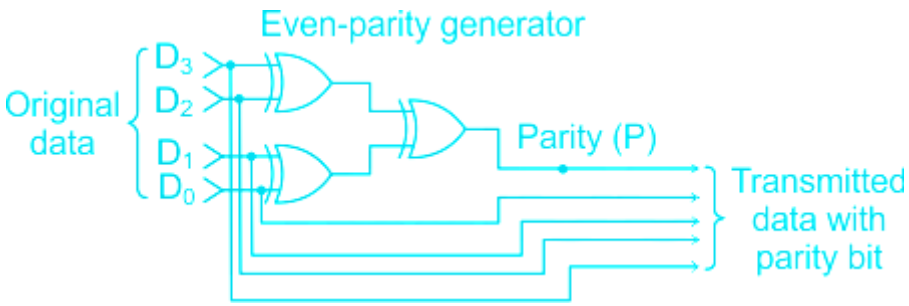
- Ex-OR and Ex-NOR gates are useful in circuits for parity generation and checking.
- The receiver uses a parity checker to detect any single-bit errors that may have occurred during the transmission. The circuit for parity checker using Ex-OR gates is as shown:



★ Important Points

In the transmission of data from one place to another, the transmitter can attach a parity bit to a set of data bits before transmitting the data bits to a receiver.

The logic circuitry for parity generation is as shown:



---

42. Answer: c

Explanation:

<u>Concept:</u>

In the induction motor rotor always rotates speed less than synchronous speed.

The difference between the rotor speed (N) and the rotating magnetic flux speed (Ns) is called slip.

The induction motor slip is usually expressed as a percentage of synchronous speed (N S) and is represented by symbol s.

Mathematically, Percentage slip, $\% \ s = \left[\frac{N_s - N}{N_s}\right] \times 100$

Or fractional slip, $s = \frac{N_s - N}{N_s}$

<u>Calculation:</u>

Given,

N_s= 1000 RPM

N = 980 RPM

$\therefore \ \% \ s = \left[\frac{N_s - N}{N_s}\right] \times 100$

$= \ [\frac{1000-980}{1000}] \times 100$

= 2.

---

43. Answer: d

Explanation:

Concept:

- LED drivers are the driving force that provides and regulates the necessary power to make sure the LEDs operate in a safe and consistent manner. One important choice is that of choosing a constant current LED driver versus a constant voltage LED driver.
- **Constant current LED drivers** are designed for a designated range of output voltages and a fixed output current (mA). LEDs that are rated to operate on a constant current driver require a designated supply of current usually specified in milliamps (mA) or amps (A).

⭐ Important Points

Constant voltage LED drivers are used for LEDs that require one stable voltage and have a current that is already regulated either via simple resistors or an internal constant current driver.

---

44. Answer: c

Explanation:

Concept:

N-P-N: emitter – base – collector

Hence the majority carriers in emitter are electrons and minority carriers are holes.

Since the base belongs to P-type dopants are it receives electrons injected from the emitter into the base.

⭐ Important Points

P-N-P: emitter – base – collector

Hence the majority carriers in emitter are holes and minority carriers are electrons.

Since the base belongs to N-type dopants are it receives holes injected from the emitter into the base.

P-N-P-N: In many circuits, a special type of switching is required. The requirement is of a device that is permanently in the forward bias. It must be in a non-conducting (high impedance) state normally and should exhibit conduction (low impedance) across its two terminals when an external signal is applied to a third terminal. Thus, switching is achieved by blocking and controlling the current through a third external signal. Such devices are known as Semiconductor-controlled Rectifiers (SCR) or popularly, Silicon Conducting Rectifiers because of the extensive use of silicon in semiconductor devices. Such devices are also known as p-n-p-n switching devices because of their characteristic structure, as we shall see in the forthcoming section.

---

45. Answer: a

Explanation:

Moving Iron Instruments (MI instruments):

The instrument in which the moving iron is used for measuring the flow of current or voltage is known as the moving iron instrument. Moving iron type instruments are of mainly two types. Attraction type and repulsion type instrument.

Attraction Type:

- Whenever a piece of iron is placed nearer to a magnet it would be attracted by the magnet. The force of this attraction depends upon the strength of the

magnetic field .

- If the magnet is electromagnet then the magnetic field strength can easily be increased or decreased by increasing or decreasing current through its coil. Accordingly, the amount of attraction force acting on the piece of iron would also be increased and decreased.
- The attraction type moving iron instrument was developed depending upon this phenomenon.

Repulsion Type:

- Whenever two pieces of iron are kept side by side and a magnet is brought nearer to them the iron pieces will repel each other. This repulsion force is due to the external magnetic field. This repulsion force increases if the field strength of the magnet is increased.
- If the magnet is electromagnet, then magnetic field strength can easily be controlled by controlling input current to the magnet. Hence if the current increases the repulsion force between the pieces of iron is increased and it the current decreases the repulsion force between them is decreased.
- The repulsion type moving iron instrument was developed depending upon this phenomenon.

---

46. Answer: d

Explanation:

Concept:

- Carrier frequency ranges for broadcast television transmission vary from country to country and type of TV (digital/analog).
- TV transmission uses satellites therefore it requires high frequency.
- For TV transmission vestigial sideband modulation is used for analog video and frequency modulation for analog audio.
- Generally, the UHF band is used for TV transmission.

⭐ Important Points

The frequency spectrum for the complete range is:

Name	Frequency Range
Very low frequency (VLF)	0.003 MHz – 0.03 MHz
Low frequency (LF)	0.03 MHz – 0.3 MHz
Medium frequency (MF)	0.3 MHz – 3 MHz
High frequency (HF)	3 MHz – 30 MHz
Very High frequency (VHF)	30 MHz – 300 MHz
Ultra-High Frequency (UHF)	300 MHz – 3000 MHz
Super High Frequency (SHF)	3000 MHz – 30,000 MHz
Extra-High Frequency (EHF)	30,000 MHz – 3,00,000 MHz

---

47. Answer: c

Explanation:

- FET is a voltage-driven/controlled device, i.e. the output current is controlled by the electric field applied.

- The current through the two terminals is controlled by a voltage at the third terminal (gate).
- It is a unipolar device (current conduction is only due to one type of majority carrier either electron or hole)
- It has a high input impedance.
- For a FET, either $I_D = I_{D_{SS}}\left(1 - \frac{V_{GS}}{V_P}\right)^2$ in case of JFET or $I_D = K(V_{GS} - V_T)^2$ in case of MOSFET So, a FET is a voltage-controlled current source.

Important Points

The difference between FET and BJT is explained in the following table:

FET	BJT
Unipolar device: Uses only one type of charge carrier	Bipolar device: Uses both electron and hole
Voltage-controlled device: voltage between gate and source control the current through the device.	Current-controlled device : Base current control the amount of collector current
High input resistance	Low input impedance
Faster in switching	Slower in switching

---

48. **Answer: c**

Explanation:

The trigger in an oscilloscope stabilizes the waveform by controlling where, on a waveform's voltage and slope, the display trace or sweep begins each time.

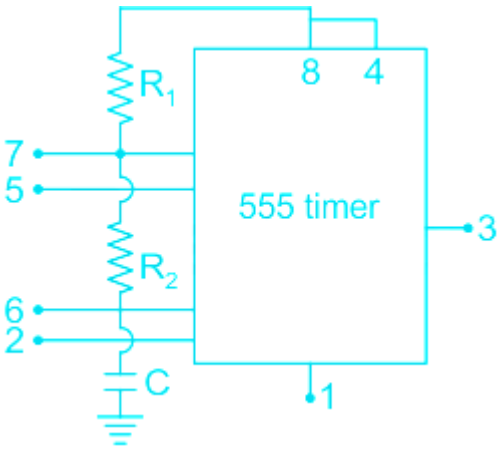
The type of trigger and its function in DSO is as shown below:

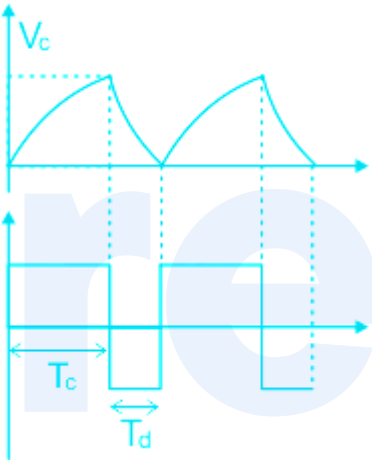
Trigger	Description
LED	Lights RED while waiting. Switches to trigger source color when fired
TYPE	Specifies trigger type from those provided by the BitScope.
SOURCE	Selects the analog channel or logic channels as the trigger source.
EDGE	Selects rising or falling edge.
LEVEL	Triggers voltage level.
Cursor	Adjustable, trackable trigger level cursor.
FILTER	Adjustable trigger filter and hold-off
POINT	The trigger point
REF	The trigger level reference voltage
AUTO	Auto-trigger enable

49. **Answer: c**

Explanation:

555 timer A stable Multivibrator pin diagram is shown below:





$Duty\ Cycle = \frac{T_{on}}{T_{on}+T_{off}}$

Total time = 1/frequency = 10 ms

T_{off} = 2 ms

$T_{on} + T_{off}$ = Total time

T_{on} = (10 - 2) = 8 ms

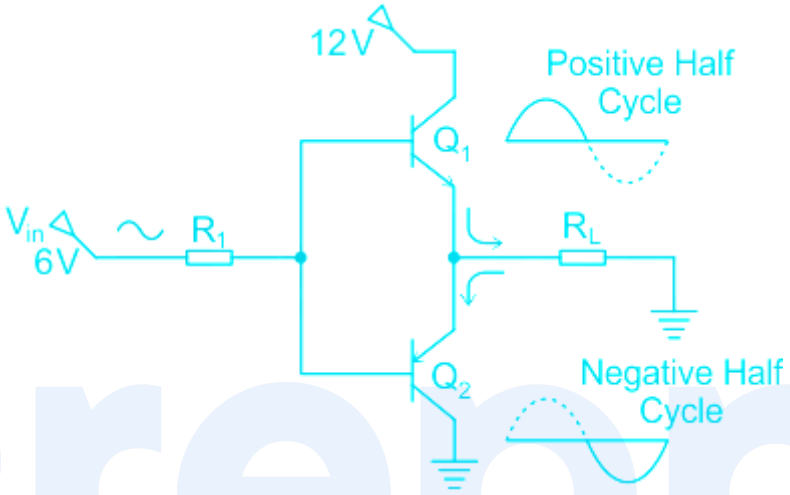
$Duty\ Cycle = \frac{8}{10} = 80\ \%$

---

50. Answer: c

Explanation:

- Push-Pull is a power amplifier that is used to supply high power to the load.
- It consists of two transistors in which one is NPN and another is PNP.
- One transistor pushes the output on a positive half-cycle and the other pulls on a negative half cycle. This is why it is known as a push-pull amplifier.
- The push-pull Amplifier circuit is as shown:



There are three classifications of Push-Pull amplifier:

- Class A amplifier
- Class B amplifier
- Class AB amplifier

Features of Push-Pull :

- Class AB type Push – Pull amplifiers suffer from the cross – over distortion.
- Class B type amplifiers are designed to overcome this problem. It can eliminate distortions and noise that have been occurred in the circuit.
- Due to the Class B operation, their collector efficiency is quite high (> 50 %)
- It is capable of generating high gains.
- There are certain cases where these amplifiers produce harmonic distortions . So depending upon the requirement of the circuit the amplifier is chosen.

---

51. Answer: b

Explanation:

Online UPS:

- Online UPS are also known as double conversion UPS or true online UPS. There are two stages in its operation.
- In the first stage, the mains AC is rectified to DC. There is a DC bus. DC bus can get power from both the DC battery and DC obtained by rectifying the mains AC.
- In the second stage, DC power available from DC bus is converted to AC by the inverter and this AC is connected to the output.
- In normal operation, output comes from mains AC via rectifier and inverter.
- When mains AC fail, output comes from DC battery via an inverter. The changeover is instantaneous. There is no power transfer switch and hence no time delay.
- When mains AC is available normal operation continues and the rectifier recharges the battery.
- A bypass switch connects mains AC directly to the output in case there is some problem with the UPS.

---

52. Answer: d

Explanation:

PAR LED Bulbs

- The PAR bulbs stands for Parabolized Aluminum Reflector.
- This lighting technology is characterized by using an internal reflector to focus its entire lighting output in one direction.
- Unlike standard A type bulb which radiates equally in all directions.
- PAR light bulbs are typically used when a highly directional light source is required, such as in spotlights or recessed downlights.

Applications of PAR LED Bulbs:

1) PAR LED lamps are free from ultraviolet and infrared radiation, hence used in Museums and art exhibition to avoid damage to artwork.

2) Illumination of decorative features in residential and commercial buildings, hotels & restaurants.

---

53. Answer: c

Explanation:

- PIN photodiodes are used in fibre optic network cards and switches.
- They are designed to detect photons and are used in optical detection.
- Reverse current flows through the photodiode when it is sensing light.
- When photons excite carriers in a reverse-biased p-n junction, a very small current proportional to the light intensity starts to flow.
- The intensity depends on the wavelength of the light.
- Photodiodes convert incident light into electric energy, so they are used as optical detectors.

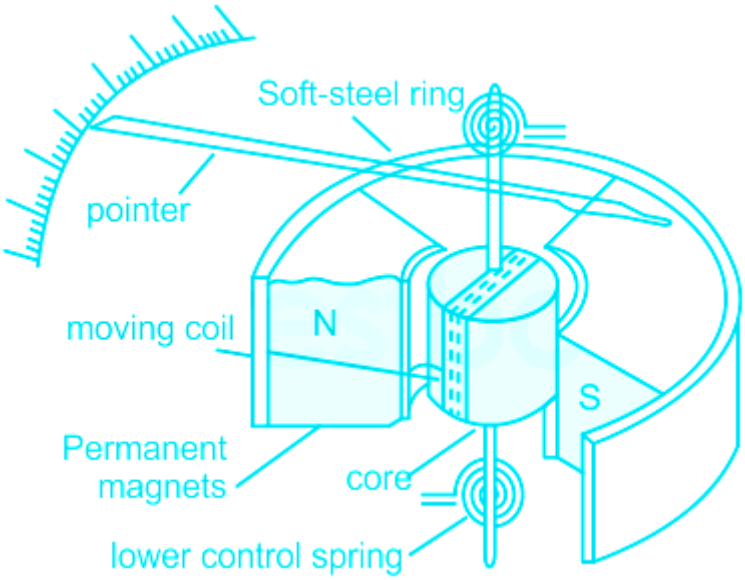
---

54. Answer: b

Explanation:

Permanent Magnet Moving Coil Instrument (PMMC):

- It works similar to a permanent magnet DC motor with a limited rotation.
- DC motor works on Faradays's Voltage law.
- It is also known as MC (Moving Coil) instrument.



- The coil rotates between the magnetic field of the permanent magnet for measuring the DC quantities
- It works on the principle that the force acting on the coil places between the magnetic field of the permanent magnet.
- And because of this magnetic field, the coil rotates.

Faraday's Voltage law:

The Induced voltage in a circuit is proportional to the rate of change over time of the magnetic flux through that circuit.

In MC instrument,

The induced emf in a coil is equal to the negative of the rate of change of magnetic flux times the number of turns in the coil.

- Moving coil galvanometer is an electromagnetic device that can measure small values of current.
- It works on the principle that when a current loop is placed in an external magnetic field, it experiences torque, and
- The value of torque can be changed by changing the current in the loop

Points to remember:

Moving Iron Instrument	Moving Coil Instrument
It uses the soft iron piece as a rotating element.	It uses the coil as a rotating element.
The MI iron instrument has a non-uniform scale.	The moving coil instrument has a uniform sale.
MI instrument is less accurate	PMMC is more accurate
It uses the air friction damping	It uses the eddy current damping system.
It is used for measuring both the direct and alternating current	It is used for the DC measurement
The gravity or spring provides the controlling torque to the instrument.	The spring provides the controlling torque to the moving coil instrument.
The moving iron instrument can be used as an ammeter, voltmeter, and wattmeter.	the moving coil instrument is used as a voltmeter, ammeter, galvanometer, and ammeter.
It measures the RMS value of quantity and the deflection is directly proportional to the square of the current.	It measures the average value of quantity and the deflection is directly proportional to the current.

55. **Answer: a**

Explanation:

- In a mobile phone, a **26 MHz** crystal oscillator is located on PCB build with metal which is found near PFO in most of the mobile phones.
- PFO is the type of IC found in the network section near antenna switch which is also called as an amplifier or bandpass filter. It filters and amplifier the network frequency.
- The crystal oscillator filters the network and creates frequency for outgoing calls.
- There will be a problem in the mobile phone networks and outgoing calls if it gets faulty.

⭐ **Important Points**

The important components of mobile phones are as follows:

1) Charging IC.

2) Antenna point.

3) RAM.

4) VCO.

5) RX filter and TX filter.

6) P.F.O

7) Flash IC

8) CPU.

9) 26 MHz crystal oscillator.

10) ROM.

56. **Answer: b**

Explanation:

The features of power amplifiers:

- As the power amplifiers are handling a large amount of power it is important to transfer maximum power to the load.
- To do so, impedance matching between the o/p impedance of the power amplifier and load has to be ensure.
- Because the loads like loudspeakers are having low impedance.
- Power amplifiers are also having low output impedance to match to the load.
- The common collector or emitter follower circuit is normally used as the power amplifier because it has a low o/p impedance.
- Due to the use of heat sinks and large size power transistors, the power amplifiers' become bulky.
- A transformer may also be used for impedance matching on the o/p side.

---

57. **Answer: c**

Explanation:

- **In the star-delta starting method of induction motor, a two-way switch is used to connect the stator winding in star while starting and in delta while running at normal speed.**
- In the star-delta starting method of induction motor, the starting current is reduced approximately by 1/3 times as compared to the original.
- The starting torque will 1/3 times that it will be for delta connected winding.
- During starting the stator winding is star connected, so that voltage over each phase in the motor will be reduced by a factor of 1/√3 of that would be for delta connected winding.
- Hence a star-delta starter is equivalent to an auto-transformer of ratio 1/√3 or 57.73 % reduced voltage.

---

58. **Answer: a**

Explanation:

Concept:

In a series combination of cells, the EMFs get added if it is of the same polarity and subtracted if it is of opposite polarities.

In series combination, overall resistance = sum of individual resistance.

Calculation:

Number of cell = 10

EMF on individual cell = 2 V

Internal resistance = 1 Ω

Load resistance = 10 Ω

Combined EMF = 2 × 10 = 20 V

Combined resistance of cell = 1 × 10 = 10 Ω

Total resistance = Combined resistance of cell + Load resistance

= (10 + 10) = 20 Ω

Current = Voltage/ Resistance = 20 / 20 = 1 A

---

59. **Answer: c**

Explanation:

Comparison between LED TV and LCD TV

LED TV	LCD TV
LED : Light emitting diode	LCD: Liquid crystal display
It is pn junction device	LCD is an optical device
LED TV uses LEDs backlight	LCD TV use fluorescent backlight
Better picture quality	Not up to the level
Thinner than LCD TV	Thicker in size
Very costly	Less costly
More power required	Less Power required

LCD uses fluorescent backlight and not LED backlighting.

---

60. **Answer: c**

Explanation:

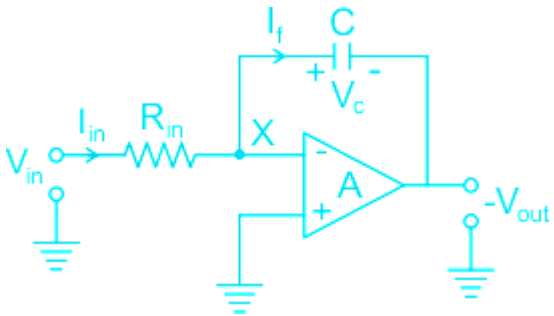
- Bi-color LEDs are same LEDs as uni-color just there are more than one LED housed in one package.
- A bi-colour LED has two LEDs wired in 'inverse parallel' (one forwards, one backwards) combined in one package with two leads.

- One LEDs anode is connected to another LEDS cathode and other lead same way.
- Only one of the LEDs can be lit at one time.
- They are less useful than the tri-colour and RGB LEDs.

61. **Answer: b**

Explanation:

An ideal Integrator circuit is shown below:

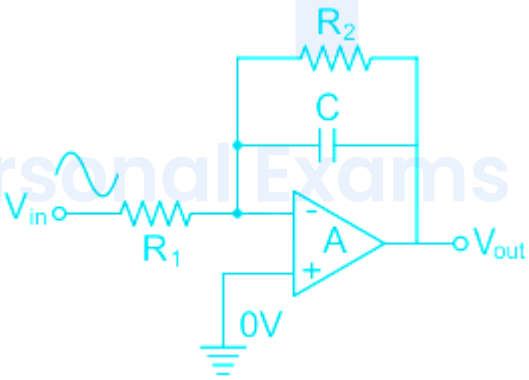


It is clear from the circuit diagram of the integrator, the feedback element is a Capacitor .

Note:

- At high frequencies, the capacitor is a short circuit so the output is 0.
- At zero frequency (0 Hz) or DC, the capacitor acts like an open circuit due to its reactance ($1/\omega C$) thus blocking any output voltage feedback.
- As a result, very little negative feedback is provided from the output back to the input of the amplifier at low frequencies.
- Therefore with just capacitor C, in the feedback path, at zero frequency the op-amp is connected like a normal open-loop amplifier with very high open-loop gain (open-loop gain of the op-amp is ideally infinite).
- This high gain can cause op-amp to be unstable and possible voltage rail saturation.

To avoid undesirable conditions due to high gain. The circuit connects a high-value **resistance in parallel** with a continuously charging and discharging capacitor C. The addition of this feedback resistor, R_2 across the capacitor, C gives the circuit the characteristics of an inverting amplifier with finite closed-loop voltage gain given by $\frac{R_2}{R_1}$



Therefore, at very low frequencies, the op-amp acts like an inverting amplifier and at very high frequencies the feedback resistor also acts like a short circuit (∵ the impedance of the capacitor is 0) and thus producing output = 0.

---

62. Answer: c

Explanation:

Concept :

For an 'n' flip flop counter,

- The total number of states = 2^n (0 to $2^n - 1$)
- The largest number that can be stored in the counter = $2^n - 1$

To construct any mod counter, the minimum number flip flops required such that:
Modulus $\leq 2^n$

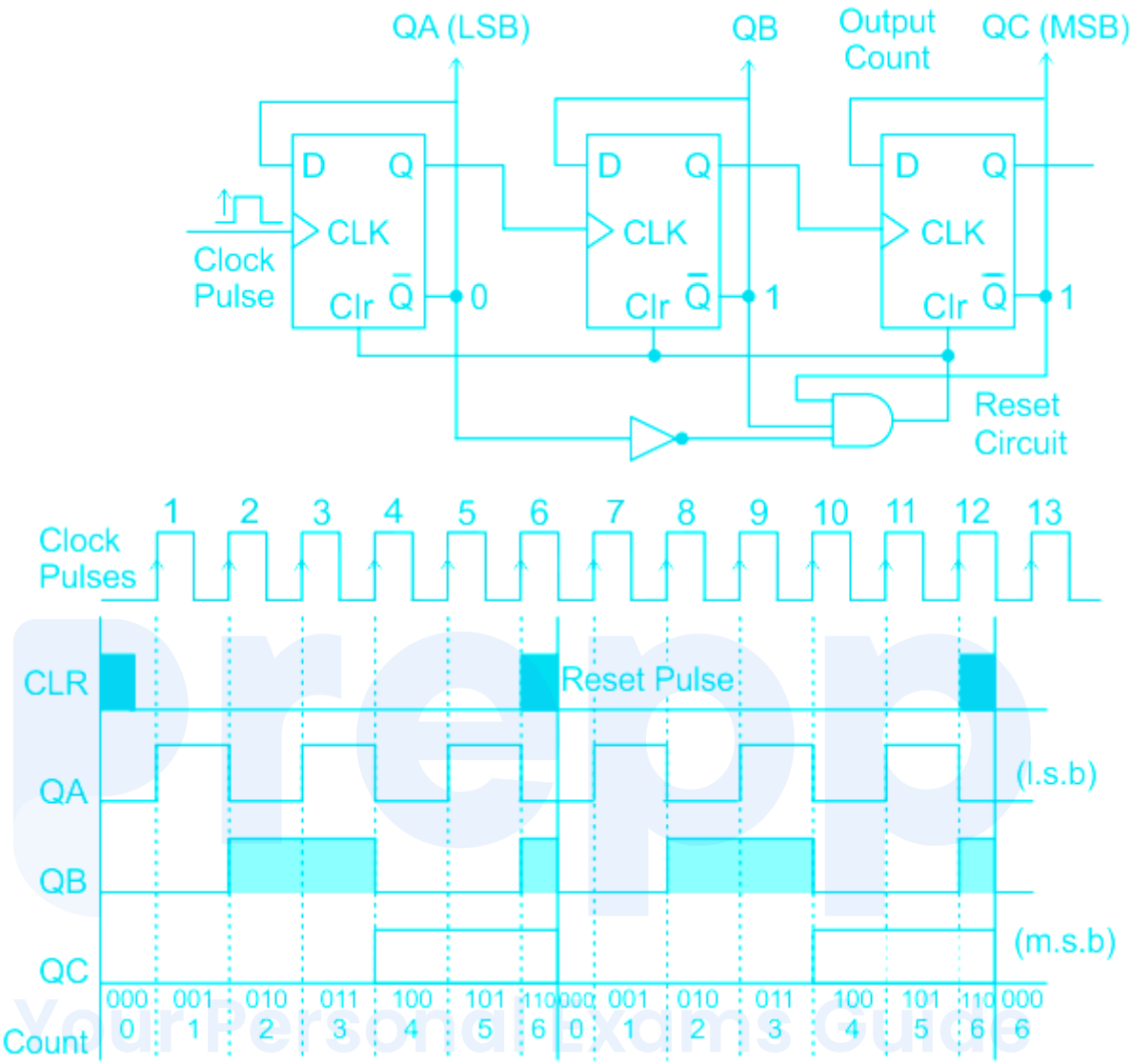
Where n is the number of counters.

For example,

A MOD-5 counter requires:

$2^n \geq 5$

$\therefore$ 3 Flip Flops



Calculation :

Number no. of flip – flops are required to construct a mod-12 counter is obtained as:

$2^n \geq 12$ i.e. n = 4

---

63. Answer: b

Explanation:

Concept:

The gain of a typical op-amp is inversely proportional to frequency. An op-amp is characterized by its gain-bandwidth product.

For example, an op-amp with a gain-bandwidth product of 1 MHz would have a gain of 5 at 200 kHz, and a gain of 1 at 1 MHz. This low-pass characteristic is introduced deliberately because it tends to stabilize the circuit by introducing a dominant pole. This is known as frequency compensation.

Calculation:

gain × bandwidth = 1 MHz

At any frequency, the gain bandwidth product will be equal = 1 MHz

gain = 1

$\therefore$ Bandwidth = $\frac{1\ MHz}{1}$

Bandwidth = 1000 kHz

---

64. Answer: b

Explanation:

- The IC 74LS138 is a 3 to 8 line decoder integrated circuit from the 74xx family.
- The main function of this IC is to decode otherwise **demultiplex** the applications.
- The decoder 74LS138 IC uses advanced technology like silicon (Si) gate TTL technology.
- 74LS138 IC has 3 binary select inputs like A, B & C. If the IC is activated, then these input pins will decide which of the 8 usually HIGH outputs will go LOW.
- As this IC includes three enable pins (where two pins are active low and one is active high) the necessity of outside gates is not there.
- These are suitable for applications like memory address decoding, data routing, etc.

⭐ Important Points

- Two **IC74LS83** is required to design an 8-bit adder/8-bit subtractor
- **IC 74152** is an 8:1 Multiplexer.

---

65. **Answer: d**

Explanation:

SMPS (Switched-mode power supply):

- A switched-mode power supply is an electronic power supply that uses a switching regulator to convert electrical efficiently.
- Generally, SMPS **transfers power from a DC or AC source to DC loads.**

Advantages:

- The higher power conversion efficiency is an important advantage of a switched-mode power supply. Switched-mode power supplies may also be substantially **smaller and lighter than a linear supply due to the smaller transformer size and weight.**
- These are compact in size because of the **smaller transformer** due to **higher operating frequency (typically 50 kHz – 1 MHz).**

Comparison between SMPS and Linear power supply:

parameter	Linear power supply	Switched-mode power supply
operation	It completes the stepping down of AC voltage first then it converts it into DC	It converts the input signal into DC first then it steps down the voltage up to the desired level
Size and weight	Heat sinks for high power linear regulators add size and weight. **Transformer, if used are large due to low operating frequency (50 or 60 Hz)**	**Smaller transformer due to higher operating frequency typically (50 kHz – 1 MH)**
Efficiency	**Low efficiency** about 30 -65 %	Provides **higher efficiency** up to 96% with modern technics
complexity	It is a **simpler circuit** , consists of a regulating circuit along with noise filtering capacitors.	**A more complex circuit** that includes a controller IC, several transistors, diodes, transformer, etc.
Noise and EMI (electromagnetic interference)	It **immune to noise and electromagnetic interference**	**The effect of noise** and electromagnetic is quite **significant** , thus the EMI filters are required.
Radio	No radio interference	Radiofrequency shielding

interference		is required as switching produces more Radio interference.
Reliability	More reliable when compared to SMPS	Its reliability depends upon transistors used for switching
Transient response	It gives a faster response	It gives a slower response compared to the linear power supply
Applications	• Control circuits, low noise amplifiers, signal processors, • Automated laboratory test equipment, and data acquisition sensors & circuits	• Used in domestic application like personal computers, • Electrolysis, waste treatment, or fuel cell applications • DC motors, slot cars, aviation, and marine applications • Battery charging for lithium-ion batteries used in aviation and vehicles • Electroplating, anodizing, electroforming process

Hence, the transformer of the SMPS is smaller in size when compared to the transformer in the linear power supply because of its high operating frequency.

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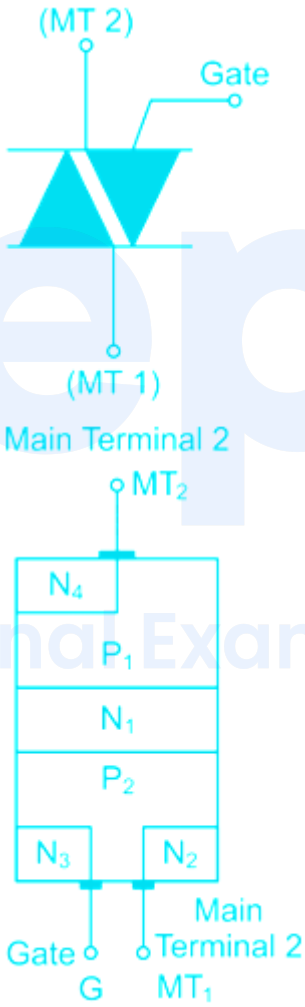
66. **Answer: c**

Explanation:



- A TRIAC is equivalent to two SCRs joined together in back to back(Anti-parallel).
- It has two main terminal and one gate
- In the TRIACs, there will be single gate control conduction in both the directions
- It is a bidirectional device and in both the directions it will conduct

- It is available in high voltage ratings
- TRIAC is a four-layer device

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67. Answer: a

Explanation:

Concept:

In a transformer,

turns ratio is given by,

$n = \frac{N_1}{N_2} = \frac{V_1}{V_2} = \frac{I_2}{I_1}$

Where N_1 = number of primary turns

N_2 = number of secondary turns

V_1 = Primary voltage

V_2 = secondary voltage

I_2= secondary current

I_1= primary current

Calculation:

Number of secondary (N_2) = 100

Primary voltage (V_1) = 200 V

Secondary voltage (V_2) = 50 V

$\frac{N_1}{N_2} = \frac{V_1}{V_2}$

$N_1 = N_2 \times \frac{V_1}{V_2} = 100 \times \frac{200}{50}$

$= 400$

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68. Answer: c

Explanation:

CSMA stands for Carrier Sense Multiple Access.

- It is a Media Access Control (MAC) **protocol that is used to control the flow of data in a transmission media so that packets do not get lost and data integrity is maintained.**
- There are two modifications to CSMA: 1) CSMA CD (Collision Detection) and 2) CSMA CA (Collision Avoidance)

CDMA stands for Code Division Multiple Access.

- It is a channel access method used by various radio communication technologies.
- The principle of the spread spectrum is used to work with CDMA.
- CDMA is not frequency specific to each user, instead, every **channel uses the full available spectrum.**
- Each user in a CDMA system uses a different code to modulate their signal.

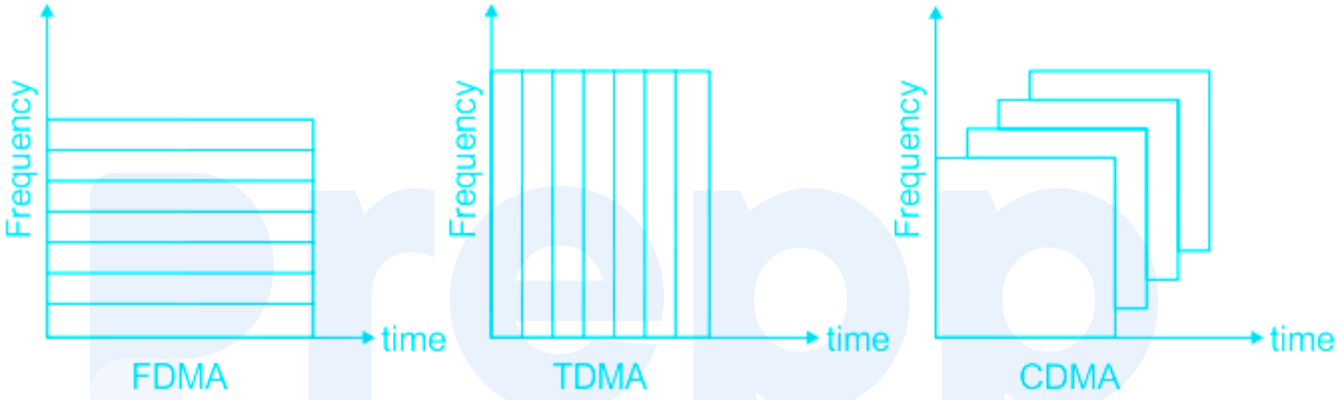
FDMA stands for Frequency Division Multiple Access.

- >FDMA is a channel access method used in some multiple-access protocols.
- >FDMA allows multiple users to send data through a single communication channel, such as a coaxial cable or microwave beam, by dividing the bandwidth of the channel into separate non-overlapping frequency sub-channels and allocating each sub-channel to a separate user.
- Users can send data through a sub-channel by modulating it on a carrier wave at the sub-channels frequency.
- >FDMA is not vulnerable to timing errors.

⭐ Important Points

Time-division multiple access (TDMA)

- This is a channel access method for shared-medium networks.
- It allows several users to share the same frequency channel by dividing the signal into different time slots.
- The users transmit in rapid succession, one after the other, each using its own time slot. This allows multiple stations to share the same transmission medium (e.g. radio frequency channel) while using only a part of its channel capacity.
- TDMA is vulnerable to timing errors.



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69. Answer: a

Explanation:

Concept:

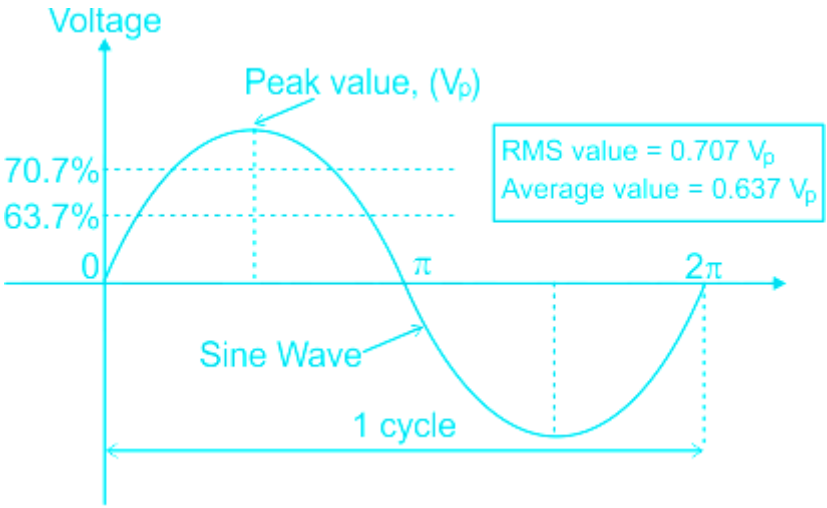
The average value of sinusoidal waveform over one complete cycle is zero as two halves cancel each other, so the average value is taken over half a cycle.

\({V_{avg}} = \frac{1}{\pi }\mathop \smallint \nolimits_0^\pi {V_p}\sin \theta \;d\theta \)

$V_{avg} = \frac{V_p}{\pi}(-\cos\theta)_0^\pi$

$V_{avg} = \frac{2V_p}{\pi} = 0.637 \times V_p$

Therefore, the average value of a sinusoidal wave is 0.637 times the peak value.



Calculation:

Given,

V_{avg} = 12.74 V

$V_{avg} = \frac{2V_p}{\pi} = 0.637 \times V_p$

$V_p = \frac{12.47}{0.637}\ V$

= 19.57 V

∵ We are asked to find the peak to peak voltage.

∴ $V_{p\text{-}p}$ = 2 × 19.57 ≈ 40 V

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70. Answer: c

Explanation:

Example:

- "Proximity Sensor" includes all sensors that perform non-contact detection.
- A **proximity sensor** often emits an electromagnetic field or a beam of electromagnetic radiation (infrared, for instance), and looks for changes in the field or return signal.

- There are various types of Proximity Sensor. These are Inductive sensor, Capacitive sensor, Ultrasonic sensor, Photoelectric sensor, and Magnetic Sensor.
- Inductive sensors are used to detect only metal objects.
- Capacitive sensors are used to detect both metallic and non-metallic objects.
- Ultrasonic sensors can detect objects in solid, liquid, or granular as well.
- Magnetic proximity sensors are proximity devices used to detect magnetic objects through their large sensing ranges.
- Proximity sensors detect objects directly in front of them by detecting the sensor's own transmitted light reflected back from an object's surface.

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71. Answer: b

Explanation:

Addressing Modes of 8051:

- The way in which the data sources on the destination address are specified in the instruction mnemonic for moving the data is called the Addressing modes.
- In 8051, the destination address is written first, followed by the source address.
- Syntax: MOV [destination], [source]

Immediate Addressing Mode: In this mode, the source operand is constant rather than a variable, and sign '#' is used to indicate it.

Ex- MOV A, # 52H

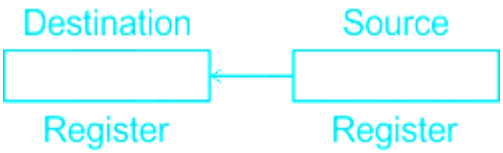
⭐ **Important Points**

Along with Immediate Addressing mode, different modes of addressing are described below:

1) Register Addressing mode: If the source operand is specified by eight working registers (R0-R7) and (A, B)

Ex- MOV, A, R3

ADD, A, R4



Note: MOV R0, R1 is not a possible instruction.

2) Direct Addressing mode: If the source operand is specified by its 8-bit address in an instruction available on internal RAM and special function Register, then it is a direct addressing mode.

Ex: MOV A, 50H; load byte from address 50H into 'A'

3) Indirect Addressing Mode: R0 and R1 of each register bank can be used as an index or pointer register. R0 and R1 points the contents in the RAM and DPTR

The instruction with indirect addressing uses the '@' sign.

Ex- MOV A, @ R0 =, Load the contents pointed by R0 in A

4) Index addressing Mode: The source Memory can only be accessed from program memory.

- The destination operand is always the register 'A'.
- Either the DPTR or PC can be used as an index register.

E.g. MOVC A, @ A + DPTR: This instruction adds the unsigned 8-bit & accumulator contents into a sixteen-bit data pointer and uses the sum as an address from which the byte is moved into accumulation.

5) Register specific: Inherent in the instruction these refer to a specific register such as accumulator or DPTR.

Ex- SWAP A: Swap nibbles with Accumulator

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72. Answer: d

Explanation:

Refractive index: The ratio of the speed of light in a vacuum to speed of light in a medium is called the refractive index of that medium. It is also called an absolute refractive index.

$$\text{Refractive index } (\mu) = \frac{Speed\ of\ light\ in\ vaccum(C)}{Speed\ of\ light\ in\ a\ medium(v)}$$

Relative refractive index : When a light ray is going from one medium (other than vacuum) to another medium then the value of the refractive index is said to be a relative refractive index.

$$\text{Refractive index of medium 1 with respect to medium 2}(n_{21}) = \frac{refractive\ index\ of\ medium\ 1(n_1)}{Refractive\ index\ of\ medium\ 2(n_2)}$$

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73. **Answer: b**

Explanation:

Switched Mode Power Supply:

- **SMPS is based on the chopper principle, the output dc voltage is controlled by varying the duty cycle of chopper by PWM (Pulse Width Modulation) or FM (Frequency Modulation) techniques.**
- In SMPS, PWM technique is used for the inverter. The output of the inverter then converted to dc by a diode rectifier.
- As the inverter is made to operate at a very high frequency, the ripples on the dc output voltage can be filtered out easily by using small filter components.
- If the switching devices are power transistors, the chopping frequency is limited to 40 kHz.
- For power MOSFETs, the chopping frequency is of the order of 200 kHz; as a result, the size of the filter circuit and transformer decreases leading to considerable savings .
- At such frequency, ferrite core is used in transformers.
- Like other power supplies, an SMPS transfers power from a DC or AC source (often mains power), to DC loads, such as a personal computer, while

converting voltage and current characteristics. Switched-mode power supplies may also be substantially smaller and lighter than a linear supply due to the smaller transformer size and weight.

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74. **Answer: b**

Explanation:

1. In mobile phones, during calls, **the proximity sensor** detects and turns off the screen when the phone is close to our ears. This function saves power and prevents unintentional activation of other functions while engaged in a call.

2. The proximity sensor also helps to automatically turn on the display when we extract the phone from our pocket.

3. Proximity Sensor also helps to automatic volume control. Some smartphones have features that automatically increase and decrease the volume based on how close or far our hand or ear is from the phone.

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75. **Answer: d**

Explanation:

Amplification:

An amplifier is an electronic device that can increase the power of a signal. The input is given as a weak signal and the output is the amplified version of the input. The amount of amplification provided by an amplifier is measured by its gain.

A voltage amplifier is any simple circuit that produces a large voltage at its output and also the amount of power coming out from the circuit.