



BEL ECE Q & A SET - 4

1) What is the RAM and ROM size in 8051 microcontroller?

- (a) 128 byte RAM and 4 byte ROM
- (b) 128 kB RAM and 4 kB ROM
- (c) 128 byte RAM and 4 kB ROM
- (d) 128 k byte RAM and 4 byte ROM

ANS : Opt C

- 8051 is a microcontroller that has separate memory to store data and programs.
- The program is stored in non-volatile memory called ROM and Data is stored in Volatile memory called RAM.
- The size of ROM is 4K and the size of RAM is 128 bytes.

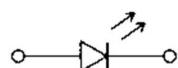
2) LED is a:

- (a) Thermistor
- (b) Transistor
- (c) Gate
- (d) P-N diode

ANS : Opt D

LED (light-emitting diode):

Basic LED diode is represented as:



- 3) An Amplifier circuit of voltage gain 100 gives 10V output, the value of input voltage is
- (a) 1000 V
 - (b) 100 mV
 - (c) 10 V
 - (d) 10 mV

ANS : Opt B

The voltage gain of an amplifier is defined as the ratio of the output voltage to the input voltage.

Mathematically, this is defined as:

$$V_{gain} = \frac{V_o}{V_{in}}$$

Calculation:

Given $V_{gain} = 100$

$V_{out} = 10 \text{ V}$

$$100 = \frac{10}{V_{in}}$$

$$V_{in} = \frac{10}{100}$$

$$V_{in} = 0.1 \text{ V} = 100 \text{ mV}$$

- 4) When amplifiers are cascaded
- (a) The gain of each amplifier is increased
 - (b) A lower supply voltage is required
 - (c) The overall gain is increased
 - (d) Each amplifier has to work less

ANS : Opt C

When amplifiers are cascaded then the overall gain is increased.

5) The Magnetic field of a magnetized iron bar when strongly heated

- (a) Becomes stronger
- (b) Becomes weaker
- (c) Reverses in direction
- (d) is unchanged

ANS: Opt B

6) _____ is a device that converts the thermal quantity into any physical quantity such as mechanical energy, pressure and electrical signals.

- (a) Photometer
- (b) Current meter
- (c) Temperature transducer
- (d) Voltameter

ANS: Opt C

A temperature transducer is a device that converts the thermal quantity into any physical quantity such as mechanical energy, pressure and electrical signals etc.

7) Expansion of HRC in fuse is _____

- (a) High Rated Current
- (b) High Rupturing Capacity
- (c) High Rated Capacity
- (d) High Rupturing Current

ANS: Opt B

HRC (High rupturing Capacity) Fuse is made by fuse wire encapsulated in airtight glass or porcelain tube filled with insulating powder. It is capable to bear a flow of twice the rated current for a few seconds.

8) The expansion of MCCB:

- (a) Main Control Circuit Breaker
- (b) Motor Control Circuit Breaker
- (c) Miniature Circuit Breaker
- (d) Moulded Case Circuit Breaker

ANS: Opt D

9) MAC address is written in which format?

- (a) Binary format
- (b) Octal format
- (c) Decimal format
- (d) Hexadecimal format

ANS : Opt D

A media access control address (**MAC**) is a unique identifier assigned to a network interface controller for use as a network address in communications within a network segment.

10) What is the total external data memory that can be interfaced to the 8051?

(a) 64 k

(b) 256 k

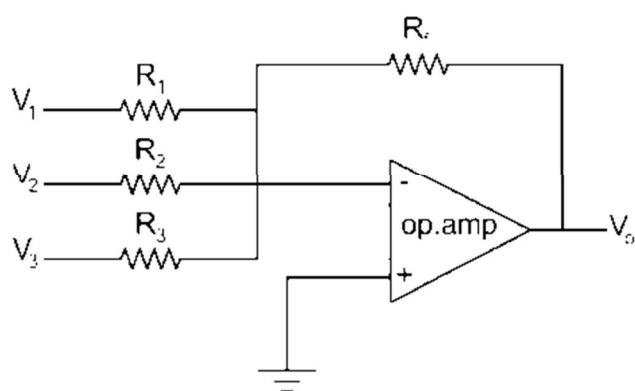
(c) 128 k

(d) 32 k

ANS: Opt A

8051 has **64kB external program memory** and **4kB on-chip program memory**, and 64kB of external data memory, and 128 bytes of on-chip data memory.

11) Calculate the output voltage if $R_1 = R_2 = R_3 = 50 \Omega$, $R_f = 1 \text{ k}\Omega$, and $V_1 = V_2 = V_3 = 50 \text{ mV}$.



(a) -3.0 V

(b) 3.0 V

(c) 1.0 V

(d) -1.0

ANS: Opt A

Due to virtual ground concept:

$$V_A = V_B = 0 \quad \text{----(1)}$$

Apply Nodal analysis at Node 'A'

$$\frac{V_A - V_1}{R_1} + \frac{V_A - V_2}{R_2} + \frac{V_A - V_3}{R_3} + \frac{V_A - V_O}{R_f} = 0$$

$$\frac{V_A - 50 \text{ mV}}{50} + \frac{V_A - 50 \text{ mV}}{50} + \frac{V_A - 50 \text{ mV}}{50} + \frac{V_A - V_O}{1000} = 0$$

$$\frac{3V_A}{50} + \frac{V_A}{1000} - 3 \text{ mV} = \frac{V_O}{1000}$$

From equation 1);

$$-3 \text{ mV} = \frac{V_O}{1000}$$

$$V_O = -3.0 \text{ V}$$

12) Automatic switching OFF function is accomplished in MCB by _____

- a) Relay
- b) clutch
- c) bimetallic-strip
- d) diode

ANS: Opt C

13)

In an RC phase shift oscillator, the phase of the feedback voltage is shifted by _____ with a three stage RC phase shift network

- (a) 0 degree
- (b) 60 degree
- (c) 90 degree
- (d) 180 degree

ANS: Opt D

- RC phase shift oscillator as shown in the figure is used to invert the input for 180° phase difference.
- The single R-C network gives the 60° phase shift
- In the RC phase shift oscillator, the inverting amplifier produces a 180° phase shift.
- The RC Phase shift Oscillator has a fixed frequency and is used at lower frequencies.

14) A gain 10,000,000 times in power is expressed as _____ db

- (a) 60
- (b) 80
- (c) 70
- (d) 120

ANS: Opt C

Power gain is the ratio of the output power (P_0) to the input power (P_{in}), i.e.

$$A_p = \frac{P_0}{P_{in}}$$

In terms of dB, the power gain is expressed as:

$$P(dB) = 10 \log_{10} A_p \text{ ----(1)}$$

Application:

Given:

$$A_p = 10,000,000 = 10^7$$

From equation (1);

$$P(dB) = 10 \log_{10} 10^7$$

$$P(dB) = 70 \log_{10} 10$$

$$P(dB) = 70$$

15)

The disadvantage of SMPS over conventional linear power supply is _____

- a) Low efficiency
- b) Bulky components
- c) Generates strong electromagnetic interference field
- d) Low cost

ANS: Opt C

In SMPS the effect of noise and electromagnetic interference is quite significant, thus EMI filters are required. The conventional linear power supply is immune to noise and electromagnetic interference.

16)

If the capacity of a battery is 4000mAh, it can supply 4 Ampere current for

a) 120 min

b) 240 min

c) 60 min

d) 30 min

ANS: Opt C

The capacity of battery = 4000 mAh

Current delivered = 4 A

$$\text{Duration of time} = \frac{4000 \text{ mAh}}{4 \text{ A}}$$

$$T = \frac{4000 \times 10^{-3} \text{ h}}{4 \text{ A}} = 1 \text{ hour}$$

T = 60 min

17)

If 100 coulomb of charge passes through a conductor in 25 s, the current in the conductor is _____

a) 1 A

b) 4 A

c) 10 A

d) 2.5 A

ANS: Opt B

Given that;

Charge (q) = 100 coulomb

Time (t) = 25 sec

$$\text{Electric current } (I) = \frac{\text{charge } (q)}{\text{Time } (t)}$$

$$I = \frac{100}{25} = 4 \text{ A}$$

18) A capacitance transducer can be used for the measurement of

- a) moisture
- b) thickness
- c) displacement
- d) All of the above

ANS: Opt C

- Capacitive transducers are used for the measurement of **displacement, and pressure**.
- The capacitive transducer comprises two parallel metallic plates that are separated by a material such as air, which is called a dielectric material.
- It works on the principle of variable capacitances i.e. the distance between the two plates is the variable.

19)

One of the following transducers is very popular for measurement of rotational displacements

- a) Shaft encoder
- b) Differential capacitor
- c) LVDT
- d) Strain gauge

ANS: Opt A

Shaft Encoder:

- A rotary encoder, also called a shaft encoder, is an electro-mechanical device that converts the angular position or motion of a shaft to analog or digital output signals.
- **It is used to measure angular position or rotational displacement.**
- Shaft Encoders can be classified into two categories depending on the nature and method of interpretation of the output:

20)

When a PLL is being used as a frequency synthesizer, the output is taken from

- a) the LPF output
- b) the VCO output
- c) phase comparator output
- d) the output of error amplifier

ANS: Opt B

21) The tracking range of a phase locked loop (PLL)

- [a) is same as its lock range]
- [b) is same as its capture range]
- [c) is half of lock range]
- [d) is half of capture range]

ANS: Opt A

The range of frequencies over which the PLL can maintain lock with the incoming signal is called **Lock Range or Tracking Range**

22) The number of frames per second in TV system in India is

- a) 25
- b) 80
- c) 20
- d) 75

ANS: Opt A

23) LVDT is a _____ transducer

- a) Eddy current
- b) Resistance
- c) Magnetostriiction
- d) Inductive

ANS: Opt D

- LVDT (Linear Variable Differential Transformer) is to convert the rectangular movement of an object to the equivalent electrical signal.
- LVDT is used to calculate displacement and works on the transformer principle.

24)

Which of the following are two most commonly used industry standards for interchip serial communications?

- a) PCI & SPI
- b) RS-232 & RS-242
- c) I2C & SPI
- d) IS-231 & RS-212

ANS: Opt C

25) Linear variable differential transformer (LVDT) used for measuring

- a) Velocity
- b) Acceleration
- c) Displacement
- d) Time

ANS: Opt C

26) Bellows transducers are used to measure:

- a) Velocity
- b) Humidity
- c) Pressure
- d) Torque

ANS: Opt C

27)

In flow transducers, _____ is not used at higher frequencies whereas _____ is suitable for suspended fluids.

- a) Bellows, balloons
- b) Accelerometer, reluctance sensor
- c) Orifice meter, venturi tube
- d) Venturi tube, orifice meter

ANS: Opt C

28) Which is internal RAM address of SBUF in 8051

- a) 99 H
- b) 83 H
- c) 82 H
- d) 88 H

ANS: Opt A

- SBUF is an 8-bit register used for serial communication in 8051 microcontrollers.
- The Serial Buffer or SBUF register is used to hold the serial data while transmission or reception.
- The internal RAM address of SBUF in 8051 is 99 H.

29)

For RS-232 interface INPUT LOW and OUTPUT HIGH voltage levels are respectively _____ and _____.

- a) +5V to +15V and -3V to -25V
- b) -3V to -25V and +5 to +15V
- c) -5V to -15V and +3 to +25V
- d) +3V to +25V and -5V to -15V

ANS: Opt D

Logic 1 is represented by negative voltage levels

Logic 1: -3V to -25 V typically (-12 V)

Logic 0 is represented by positive voltage levels

Logic 0: +3V to +25 V typically (+12 V)

30)

Which of the following types of displays are called passive displays, classified under the method of conversion of electrical data to visible light ?

- (a) Gas discharge plasma
- (b) CRTs
- (c) LCDs
- (d) LEDs

ANS: Opt C

31)

Which of the following requires a centre-tapped transformer and is used in vacuum tubes?

- (a) Two diodes full-wave rectifier circuit
- (b) Inverted bridge rectifier circuit
- (c) Bridge rectifier circuit
- (d) Single diode full-wave rectifier circuit

ANS: Opt A

32)

Which of the following statements is not correct for an ideal operational amplifier?

- a) The input current is zero.
- b) The output resistance is infinite.
- c) The input resistance is infinite.
- d) Gain is infinite.

ANS: Opt B

33) How many flip-flop circuits are needed to divide by 16?

- a) Two
- b) Four
- c) Eight
- d) Sixteen

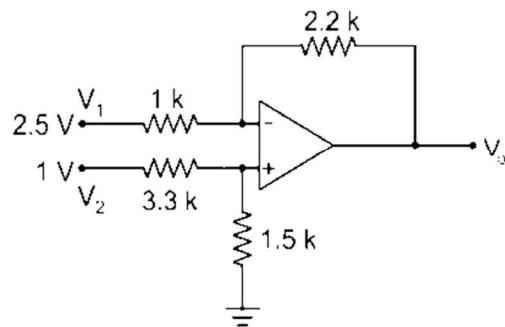
ANS: Opt B

For a counter with 'n' flip flops:

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

34)

Output voltage V_o of the circuit shown in figure below. (The input voltages are $V_1 = 2.5 \text{ V}$ & $V_2 = 1 \text{ V}$)



(a) 4.0 V

(b) -4.0 V

(c) -4.5 V

(d) 4.5 V

ANS: Opt C

$$V_1 = \frac{1.5}{(1.5+3.3)}$$

$$= 0.3125$$

$$V_2 = 0.3125 \text{ V.}$$

Applying KVL we get.

$$\left(\frac{2.5 - 0.3125}{1} \right) = \left(\frac{0.3125 - V_0}{2.2} \right)$$

$$2.2(2.5 - 0.3125) = 0.3125 - V_0$$

$$V_0 = 0.3125 - 2.2(2.5 - 0.3125)$$

$$= (0.3125 - 4.8125) \text{ V}$$

$$V_0 = -4.5 \text{ V}$$

35) Hard disk in a computer is

- a) Temporary magnetic storage
- b) Permanent magnetic storage
- c) High capacity optical disk storage
- d) High capacity CDROM

ANS: Opt B

36)

Five cells, each with an e.m.f. of 2V and internal resistance of $0.5\ \Omega$ are connected in series. The resulting battery will have

- (a) An e.m.f. of 2V and an internal resistance of $0.5\ \Omega$
- (b) An e.m.f. of 10V and an internal resistance of $2.5\ \Omega$
- (c) An e.m.f. of 2V and an internal resistance of $0.1\ \Omega$
- (d) An e.m.f. of 10V and an internal resistance of $0.1\ \Omega$

ANS: Opt B**37)**

The System program used to translate directly an assembly language to machine language is called

- a) Compiler
- b) Assembler
- c) Text editor
- d) Debugger

ANS: Opt B

- An assembler is a program that converts the assembly language into machine code.
- It takes the basic commands and operations from assembly code and converts them into binary code that can be recognized by a specific type of processor.

38) Files in an E-mail communication are send through _____

- a) disk
- b) mailbox
- c) wires
- d) attachment

ANS: Opt D

An attachment is simply an additional file sent with an email message. An attachment can be an image file, a Word document, or one of many other supported file types.

Hence, Computer data files that are included with an email message are often referred to as an **Attachment**.

39)

What is an element in an electrical circuit which serves as a protection against overload?

- a) Fuse
- b) Resistor
- c) Mica
- d) Semiconductor

ANS: Opt A

- A fuse is an electrical safety device that operates to provide overcurrent protection of an electrical circuit.
- Fuses are widely used for the protection of electric motor circuits against small overloads and short circuits.
- The motor protection circuit will open the controlling contactor automatically, and the fuse will only operate for short-circuits or extreme overload.

40) In LED, light is emitted because

- a) Recombination of charge carrier takes place
- b) Diode gets heated up
- c) Light falling on the diode gets amplified
- d) Lights gets reflected due to lens action

ANS: Opt A

41) Photodiodes operate at

- a) Forward bias
- b) Breakdown region
- c) Reverse bias
- d) Saturation region

ANS: Opt C

- An optoelectronic junction device is one that uses **light to control the flow of current through the junction.**
- The purpose of the **photodiode** is to transform light into electric current and it is a semiconductor device.

42) Which of the following is a concept in mobile communication?

- a) Triplexing
- b) Duplexing.
- c) Simplexing
- d) Quadraplexing

ANS: Opt B

Duplexing: It is a phenomena in computer modes that allows simultaneous transmission and reception in both the directions.

Simplexing: It is a phenomena in computer modes that allows telecommunication in only one direction.

43) Which of the following is an Operational amplifier?

- a) IC 8085
- b) IC 7805
- c) IC 741
- d) IC 555

ANS: Opt C

44) What is the beta current ratio of a transistor?

(a) I_C/I_B

(b) I_B/I_E

(c) I_E/I_C

(d)
 I_C/I_E

ANS: Opt A

The common-emitter current gain (β) is the ratio of the transistor's collector current to the transistor's base current, i.e.

$$\beta = \frac{I_C}{I_B}$$

45) LCD TV work on the principle of _____

[a) emission of cathode rays and light

[b) emission of cathode rays

[c) light emission

[d) light blockage

ANS: Opt D

46) Find Current, if Resistance = 50 ohms and Power = 100 Watts

- a) 2 A
- b) 1.414 A
- c) 3 A
- d) 1.314 A

ANS : Opt B

The power dissipated by a resistor is given by:

$$P = I^2 R = \frac{V^2}{R}$$

I = Current flowing across the resistor

V = Voltage across the resistor

Calculation:

Given P = 100 Watts and R = 50 Ω

$$I = \sqrt{\frac{P}{R}} = \sqrt{\frac{100}{50}}$$

I = 1.414 A

47) Which of the following panels has the best viewing angle?

- a) LCD
- b) LED
- c) Plasma
- d) CRT

ANS : Opt D

The CRT is a **display screen** that produces images in the form of the **video signal**. It is a type of vacuum tube that displays images when the electron beam through **electron guns** strikes on the **phosphorescent surface**.

48) In the context of mobile communication what is the full form of LTE?

- a) Long Term Evolution
- b) Last Time Evolution
- c) Least Time Evolution
- d) Long time Evolution

ANS: Opt A

49) In the voltage amplifier _____.

- 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.

ANS: Opt D

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.

50)

In mobile phones, when a user puts the phone to his/her ears, the screen goes off. Which is the sensor used for this?

- (a) Motion sensor
- (b) Proximity sensor
- (c) Vibration sensor
- (d) Temperature sensor

ANS: Opt B

51)

Identify the frequency of the crystal used for outgoing calls in mobile phones.

- a) 26 MHz
- b) 99 MHz
- c) 108 MHz
- d) 5.5 MHz

ANS: Opt A

- 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 amplifies the network frequency.

52)

The emitter of which of the below mentioned transistors has electrons as the majority carriers?

(a) N Channel

(b) PNP

(c) NPN

(d) PNPN

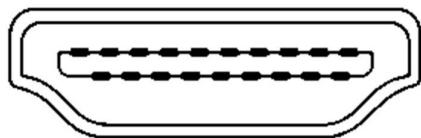
ANS: Opt C

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.

53) Identify the port shown in the image below.



(a) HDMI

(b) DVI

(c) MIDI

(d) FireWire

ANS: Opt A

- 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.

54)

A conductor of 100 m length with 1 mm diameter has a resistance of 900 mΩ. What will be the resistance of another conductor of same material with same length and 3 mm diameter?

- (a) 300 mΩ
- (b) 100 mΩ
- (c) 2700 mΩ
- (d) None of the above

ANS: Opt B

Mathematically, the resistance is given by the formula:

$$R = \rho \frac{l}{A}$$

ρ = Resistivity of the material

l = length of the material

A = Area of the cross-section

Since $A = \pi r^2$, the above expression becomes:

$$R = \frac{\rho l}{\pi r^2} = \frac{4\rho l}{\pi d^2}$$

d = diameter of the wire

Application:

$$\frac{R_1}{R_2} = \frac{d_2^2}{d_1^2}$$

Given: $R_1 = 900 \text{ m}\Omega$, $d_1 = 1\text{mm}$ and $d_2 = 3\text{mm}$

$$\frac{900}{R_2} = \frac{9}{1}$$

$$R_2 = 100 \text{ m}\Omega$$

55) The band Width of a Television channel is

[a) 5 MHz

[b) 7 MHz

[c) 9 MHz

[d) 6 MHz

ANS: Opt B

56) Typical expected life time of LED lights is

- a) 750 to 2000 hrs
- b) 6000 to 10,000 hrs
- c) 20,000 to 50,000 hrs
- d) 10,00,000 to 10,00,000 hrs

ANS: Opt C

57)

Which of the following transistor amplifier configuration is used as a buffer for impedance matching.

- (a) Common-emitter configuration
- (b) Common-base configuration
- (c) Common-collector configuration
- (d) None of the above

ANS: Opt C

58) In a C-E configuration, an emitter resistor is used for:

- a) Stabilization
- b) AC signal bypass
- c) collector bias
- d) higher gain

ANS: Opt A

- The aim of an AC signal amplifier circuit is to stabilize the DC biased input voltage to the amplifier and thus only amplify the required AC signal.
- This **stabilization** is achieved by the use of an **Emitter Resistance R_E**
- The emitter resistance provides the required amount of automatic biasing needed for a common emitter amplifier.

59)

The output characteristics of common emitter configuration shows variation of V_{ce} due to variation of I_c keeping

- (a) I_E constant
- (b) I_B constant
- (c) V_{be} constant
- (d) V_{BB} constant

ANS: Opt B

60)

For display of a sine wave in a CRO, what waveform is applied at the horizontal plates?

- (a) sinusoidal
- (b) square
- (c) saw-tooth
- (d) none of the above

ANS: Opt C

61) The OP-amp can amplify

- a) a.c. signals only
- b) d.c. signals only
- c) both a.c. and d.c. signals
- d) neither d.c. nor a.c. signals.

ANS: Opt C

- An operational amplifier is a very high gain voltage amplifier.
- It is used to amplify the signals by increasing its magnitude.
- Op-amps can amplify **both DC and AC signals.**

62)

An AM receiver is tuned to 855 kHz. If IF is 455 kHz, what is the local oscillator frequency?

(a) 400 kHz

(b) 1310 kHz

(c) 1500 kHz

(d) 1520 kHz

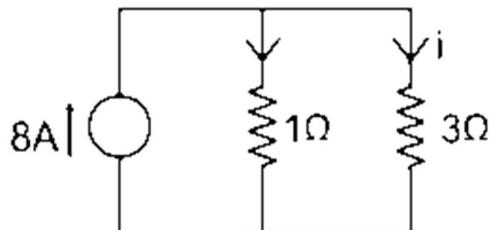
ANS: Opt B

$$f_{Uo} = f_s + f_{IF}$$

$$= (855 + 455) \text{ kHz}$$

$$= 1310 \text{ kHz}$$

63) Find the current through 3-ohm resistor



(a) 6 A

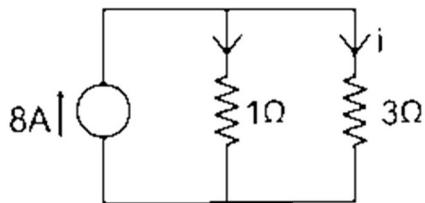
(b) 2 A

(c) 2.67 A

(d) 3 A

ANS: Opt B

Circuit given is:



Now by using the current division rule, the current through 3Ω resistor is:

$$I = \frac{1}{1+3} \times 8 = \frac{1}{4} \times 8$$

$$\therefore I = 2 \text{ A}$$

64) Which of the following is decade counter?

a) IC 7493

b) IC 7490

c) IC 7491

d) IC 7492

ANS: Opt B

65) Minimum number of flip flops required for mod-12 ripple counter is

- a) 3
- b) 4
- c) 6
- d) 12

ANS: Opt B

Number no. of flip – flops are required to construct mod-12 counter, must satisfy:

$$2^n \geq 12$$

The minimum value of n satisfying the above is:

$$n = 4$$

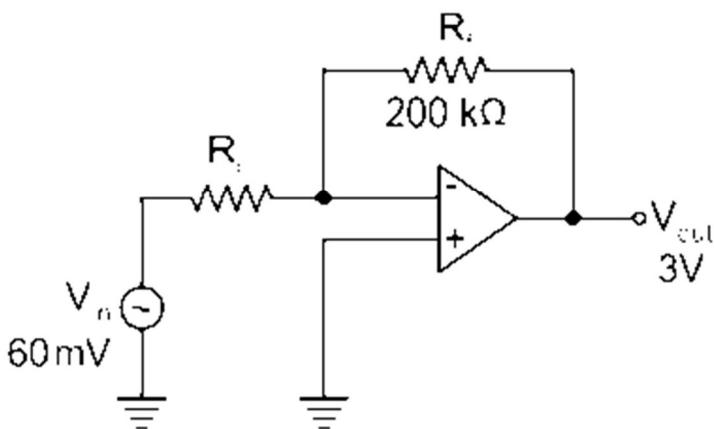
66)

Two similar satellites A and B are revolving around the earth in a circular orbit. If the ratio of the radius of the orbit of satellite A to satellite B is 1 : 2, then find the ratio of the kinetic energy possessed by satellite A to satellite B.

- (a) $1 : \sqrt{2}$
- (b) 1 : 2
- (c) 2 : 1
- (d) None of these

ANS: Opt C

67) Decreasing the gain in the given circuit can be achieved by



- (a) Reducing the amplitude of the input voltage.
- (b) Increasing the value of R_f
- (c) Increasing the value of R_i
- (d) Removing R_f

ANS: Opt C

68)

Which one of the following is not suitable for broadcast communication?

- a) Microwave communication
- b) Satellite communication
- c) Terrestrial communication
- d) Optical fiber communication

ANS: Opt D

69) The function of ALE signal in 8051 microcontroller is

- a) To extend the memory capacity
- b) To control demultiplexing the address and data bus.
- c) To distinguish between external RAM and PROM
- d) To initialize parallel port

ANS: Opt B

The Pin 30 of 8051 microcontroller is used for ALE that is Address Latch Enable.

- It is an active-high input control signal.
- ALE signal is used for demultiplexing the multiplexed Address/Data bus of Port 0 during external memory interfacing.
- In each machine cycle, there are 2 ALE pulses
- ALE is also used to check whether the device is working or not.

70)

How many $2k \times 8$ ROM chips would be required to build a $16k \times 8$ memory system?

- a) 2
- b) 4
- c) 8
- d) 16

ANS: Opt C

For $2^n \times m$ ROM chips we have:

- 1. n address lines.
- 2. m bit data lines.

The total capacity of ROM chips required = Number of ROM chips \times Capacity of single ROM chip

Analysis:

Given, the capacity of single-chip = $2k \times 8$

Required capacity = $16k \times 8$

$$\text{Number of ROM chips required} = \frac{16k \times 8}{2k \times 8}$$

$$= 8$$

71)

Two inductors of 32 mH and 8 mH are placed parallel to each other on a common core and are connected in series aiding. If the mutual inductance is 2 mH, the coefficient of coupling is

(a) 0.125

(b) 0.049

(c) 0.25

(d) 0.05

ANS: Opt A

Given:

$$L_1 = 32 \text{ mH}, L_2 = 8 \text{ mH} \text{ and } M = 2 \text{ mH}$$

If the two coils are connected in series aiding the equivalent L will be:

$$L_{\text{eq}} = L_1 + L_2 + 2M$$

We know that

$$M = k\sqrt{L_1 L_2}$$

$$k = \frac{2}{\sqrt{32 \times 8}}$$

The coefficient of coupling is 0.125

72) An AM demodulation technique is

- a) Envelop Detector
- b) Phase Locked Loop
- c) Quadrature detector
- d) Radio detector

ANS: Opt A

73)

Which of the following statements are correct regarding Radio Frequency Identification (RFID) technology?

- A. RFID refers to a wireless system comprising two components: tags and readers.
- B. The reader is a device that has one or more antennas that emit radio waves and receive signals back from the RFID tag.
- C. Passive RFID tags are powered by the reader and do not have a battery.

Choose the **correct** answer from the options given below.

- (a) A, B and C
- (b) B and C only
- (c) A and C only
- (d) A and B only

ANS: Opt A

74) Which factor determines the range resolution of a radar?

- a) Size of the antenna
- b) Bandwidth of the transmitted pulse
- c) Power radiated from the antenna
- d) Centre frequency of the radar

ANS: Opt B

75)

The transistor configuration most suitable for impedance matching is

- a) Common base
- b) Common Emitter
- c) Common Collector
- d) None of these

ANS: Opt C

- Common collector configuration, also known as emitter follower provides high input impedance and low output impedance. So they are used for the purpose of impedance matching.
- In common collector configuration, the collector terminal is common to both input and output terminals.

76) Which of the following is a universal gate?

- a) AND
- b) OR
- c) XOR
- d) NAND

ANS: Opt D

- A Universal Gate is a gate by which every other gate can be realized.
- AND, OR, NOT, etc. are basic gates.
- **NAND, NOR, etc. are the universal gate.**

77) The CRO uses _____ method of focusing

- a) Electronic
- b) Electromagnetic
- c) Electrostatic
- d) Electromechanical

ANS: Opt C

There are many techniques that are designed for the purpose of concentrating or focusing the diverged electron beam to a single point.

This can be classified into two main types that actually follow two different principles for their working, i.e.

- 1) Electrostatic focusing
- 2) Magnetostatic focusing

78) What is the main application of a 555 IC?

- a) Counter
- b) Timer
- c) Comparator
- d) Amplifier

ANS: Opt B

79) The energy of a photon varies directly with its

- a) frequency
- b) wavelength
- c) intensity
- d) rest mass

ANS: Opt A

- The energy of a photon varies directly with frequency, i.e. $E \propto v$
- The energy of a photon varies inversely with the wavelength, i.e. $E \propto \frac{1}{\lambda}$

80)

Maximum efficiency will occur, when copper loss is _____ to iron loss?

- a) Greater than
- b) Less than
- c) Equals to
- d) Any of the above

ANS: Opt C

The transformer will give **the maximum efficiency when their copper loss is equal to the iron loss.**

81) Unit of Capacitance is

- (a) Farad
- (b) Coulomb
- (c) Siemens
- (d) Henry

ANS: Opt A

82)

Kirchhoff's first and second laws are respectively based on conservation of:

- (a) Energy and charge
- (b) Charge and energy
- (c) Mass and charge
- (d) Mass and energy

ANS: Opt B

First law: According to **Kirchhoff's current law (KCL)**, the algebraic sum of the electric currents meeting at a common point is zero. I.e. the sum of currents entering a node is equal to the sum of currents leaving the node. It is based on the **conservation of charge**.

Second law: According to **Kirchhoff's voltage law (KVL)**, the algebraic sum of all the voltages around any closed path is zero. It is based on the **conservation of energy**.

83)

If the distance between two plates of a parallel plate capacitor is halved, the capacitance: -

- (a) doubles
- (b) quadruples
- (c) is halved
- (d) remains the same

ANS: Opt A

84)

What will be the color-coding of a resistor when the resistance of the resistor is $50 \pm 2\%$ ohms?

- (a) Green- Black-Brown-Red
- (b) Green-Black-Black-Brown
- (c) Yellow-Brown-Black-Red
- (d) Green-Black-Black-Red

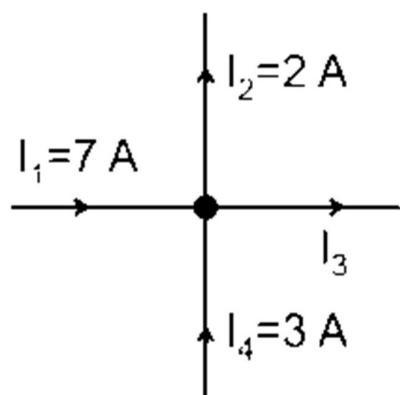
ANS: Opt D

We need $50 \Omega \pm 2\% = 50 \times 10^0 \pm 2\%$

Hence first band should be green, second band should be black. Multiplier should be 1, hence third band should be black. Tolerance is 2%, hence fourth band should be red.

Now the colour code is Green-Black-Black-Red.

85) Calculate the current in I_3 in the circuit.



(a) -8 A

(b) 8 A

(c) 7 A

(d) 12 A

ANS: Opt B

From KCL we have:

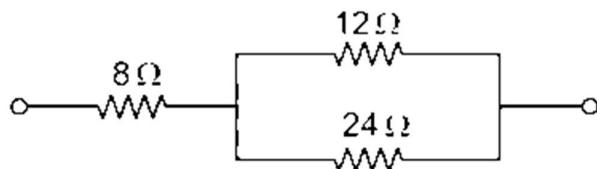
$$I_1 + I_4 = I_2 + I_3$$

$$7 + 3 = 2 + I_3$$

$$I_3 = 8 \text{ A}$$

86)

The equivalent resistance of a series-parallel circuit shown in the figure is:



(a) 8 ohms

(b) 10 ohms

(c) 12 ohms

(d) 16 ohms

ANS: Opt D

Given that $12\ \Omega$ and $24\ \Omega$ is connected in parallel

$$\text{Equivalent resistance} = \frac{12 \times 24}{36} = 8\ \Omega$$



\therefore Total Resistance between A and B

$$R_{AB} = 8 + 8 = 16\ \Omega$$

87)

Five capacitors each of $10\ \mu F$ are connected in series, the equivalent capacitance of the system is;

(a) $2\ \mu F$

(b) $20\ \mu F$

(c) $30\ \mu F$

(d) $50\ \mu F$

ANS: Opt A

$$\frac{1}{C_{eq,series}} = \frac{1}{10} + \frac{1}{10} + \frac{1}{10} + \frac{1}{10} + \frac{1}{10}$$

$$= \frac{5}{10} = \frac{1}{2}$$

$$\therefore C_{eq,series} = 2\ \mu F$$

88)

At resonant frequency, the impedance of the series RLC circuit is _____.

- (a) Purely resistive
- (b) Purely inductive
- (c) Purely capacitive
- (d) Zero

ANS: Opt A

89) Maximum power is transferred when

- (a) Load Impedance > Source Impedance
- (b) Load Impedance < Source Impedance
- (c) Load Impedance = Source Impedance
- (d) Load Impedance = 0

ANS: Opt C

90)

In a series LCR circuit, the voltages measured across the resistance, inductance and capacitance are 80 V, 120 V, and 120 V, respectively. The magnitude of the supply voltage is:

- (a) 320 V
- (b) $\sqrt{(80^2 + 240^2)}$ V
- (c) 80 V
- (d) 120 V

ANS: Opt C

Given,

$$V_R = 80 \text{ V}$$

$$V_X = 120 \text{ V}$$

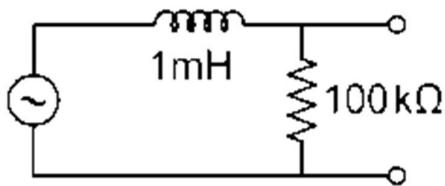
$$V_C = 120 \text{ V}$$

$$V = \sqrt{V_R^2 + (V_X - V_C)^2}$$

Putting on the respective values, we get:

$$V = \sqrt{80^2 + (120 - 120)^2} = 80V$$

91) Identify the circuit.



- (a) High pass filter
- (b) Bandpass filter
- (c) Low pass filter
- (d) Band reject filter

ANS: Opt C

92) What is the form of curve which represents Ohm's Law?

- [a] Parabolic
- [b] Hyperbolic
- [c] Linear
- [d] Sinusoidal

ANS: Opt C

- The curve for Ohm's Law in an ohmic conductor follows a **straight line**.
- This can be inferred from the definition for **Ohms's Law** which states that the potential difference (voltage) across an ideal conductor is proportional to the current through it, i.e.

$$(V \propto I).$$

93)

A 100 turn coil has an inductance of 6 mH. If the number of turns is increased to 200, all other quantities remaining the same, the inductance will be:

- (a) 24 mH
- (b) 12 mH
- (c) 3 mH
- (d) None of these

ANS: Opt A

Inductance is given by

$$L = \frac{\mu N^2 A}{l}$$

Given that all the quantities are the same except the number of turns.

Inductance is directly proportional to the square of the number of turns. $L \propto N^2$

$$\frac{L_1}{L_2} = \left(\frac{N_1}{N_2} \right)^2$$

$$L_2 = \left(\frac{200}{100} \right)^2 \times 6 = 24 \text{ mH}$$

94)

With the increase in supply frequency, the capacitive reactance of a circuit

- a) increases
- b) decreases
- c) remains same
- d) none of these

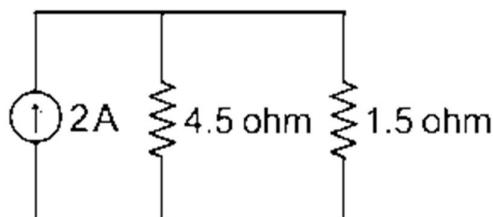
ANS: Opt B

95) A capacitor dissipates _____ energy.

- a) No
 - b) 10% of the stored
 - c) 20% of the stored
 - d) 50% of the stored

ANS: Opt A

96) In the diagram shown, what is the current in $1.5\ \Omega$ resistor?



- (a) 2.25 A
 - (b) 2.5 A
 - (c) 2 A
 - (d) 1.5 A

ANS: Opt D

Given $R_1 = 4.5 \Omega$

$R_2 = 1.5 \Omega$

I = 2 Amp

Hence current through 1.5Ω resistor

$$I_2 = \frac{4.5}{4.5+1.5} \times 2 = 1.5 \text{ A}$$

97)

Which of the following is the correct definition of phasor?

- a) An instrument used for measuring phases of an unbalanced 3-phase load
- b) A line representing the magnitude and direction of an alternating quantity
- c) A line which represents the magnitude of an alternating quantity
- d) A coloured tag or band for a distinction between different phases of a 3-phase supply

ANS: Opt B

98)

An RL circuit has a resistance of 3 Ohms and a reactance of 4 Ohms, the impedance of the circuit is

- (a) 5 Ohms
- (b) 7 Ohms
- (c) 1 Ohms
- (d) 1.33 Ohms

ANS: Opt A

Given, $R = 3$ Ohms

$X_L = 4$ Ohms and $X_C = 0$ Ohms

The net impedance of the circuit will be:

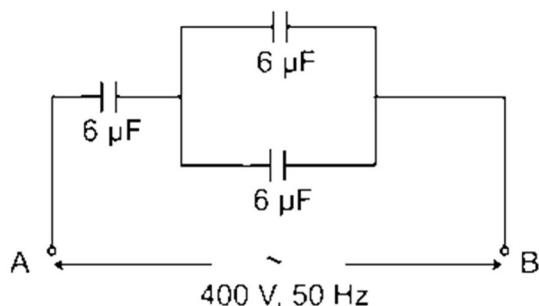
$$Z = \sqrt{R^2 + X_L^2}$$

$$Z = \sqrt{3^2 + 4^2} = \sqrt{25}$$

$$Z = 5 \text{ Ohms}$$

99)

For the circuit shown below, find the electrostatic energy (in J) stored between terminals A and B.



(a) 0.32

(b) 3.32

(c) 33.2

(d) 332

ANS: Opt A

In the given circuit diagram, two capacitors of $6 \mu\text{F}$ are connected in parallel.

Equivalent capacitance of this parallel combination = $12 \mu\text{F}$

This is connected in series with a $6 \mu\text{F}$ capacitor.

Now, the equivalent capacitance of circuit = $4 \mu\text{F}$

$$\text{Energy } E = \frac{1}{2} CV^2$$

$$E = \frac{1}{2} \times 4 \times 10^{-6} \times 400^2$$

$$E = 0.32 \text{ J}$$

100)

A 20-mF capacitor is in series with a 150-ohm resistor. The combination is placed across a 40-V DC source. The time constant of the circuit is _____.

(a) 8 s

(b) 2.4 s

(c) 6 s

(d) 3 s

ANS: Opt D

The time constant in the RC series circuit is given by:

$$\tau = RC$$

Where C = equivalent capacitance line circuit

And R = equivalent in circuit

Calculation:

$$R = 150 \Omega$$

$$C = 20 \text{ mF}$$

$$\text{Time constant } (\tau) = 150 \times 20 \times 10^{-3} = 3 \text{ sec}$$
