Department of Pre-University Education

Government of Karnataka

Question Bank

I PUC Electronics

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Chapter 1

Introduction to Electronics

One mark questions (Knowledge):

1. What is electronics?
2. Who discovered electron?
3. Who invented vacuum tube triode?
4. Who invented integrated circuits?
5. Who invented BJT?
6. Who invented JFET?
7. Expand MOSFET.
8. What is a chopper?
9. Expand OP-AMP.
10. Expand TTL.
11. Expand SCR.
12. Expand IGBT.
13. Expand VLSI.
14. Expand EPROM.
15. Expand GPS.
16. Expand WAN.
17. Expand ARPA.
18. What is internet?

One mark questions (Understanding):

1. How many electrodes are present in vacuum tube triode?
2. Name the electronic device which has replaced the bulky vacuum triode.
3. Name two semiconductor materials used in electronic device fabrication.
4. What is the function of inverter circuit?
5. Name the most commonly used semiconductor material in electronic device fabrications.
6. Name the four-bit microcontroller developed by Texas instrumentation first time.
7. Give an example for microelectronic device.
8. Name the electronic system used to trace the vehicles from the distant places.

One mark questions (Application):

1. Name any one application of Op-Amp.
2. Where do we use inverters?
3. Where do we use rectifiers?
4. Where do we use microcontrollers?
5. Write one application of GPS.

Two marks questions (Knowledge):

1. Name any four power semiconductor devices.
2. Write a note on role of electronics in day to day life.
3. Name any two medical electronic equipment.

4. List any four household electronic equipment.

Two marks questions (Understanding):

1. Distinguish between microprocessor and microcontroller.
2. Briefly explain how electronics has given us pleasant comforts.
3. Why semi conductor devices are preferred compared to vacuum tube devices.
4. Silicon is more preferred than germanium in semi conductor devices fabrication, justify.

Two marks questions (Application):

1. Mention few applications of internet.
2. Mention any two applications of electronics in entertainment.

Three marks questions (Knowledge):

1. Give a brief note on scope of electronics.
2. Write a note on role of electronics in medical science.
3. Discuss on the job opportunities available in the field of electronics.

Three marks questions (Understanding):

1. List the scale of integrations depending on number of components used in IC fabrications.
2. What is the impact of electronics in our daily life?

Three marks questions (Application):

1. Write the applications of electronics in medicine and industry.
2. Write the applications of electronics in defence and communication.
3. Write any six advantages of internet.

Chapter 2

Principles of Electricity, Network Theorems and AC principles

One mark questions (Knowledge):

1. Define electric charge.
2. Define electric current.
3. Define potential difference.
4. What are linear devices?
5. Define electric power.
6. Define kWh.
7. What is the commercial or Board Of Trade (BOT) unit of electrical energy?
8. What is the direction of conventional current?
9. What is a node?
10. What is a closed loop?
11. What is an open loop?
12. What is a mesh?
13. Give an expression for instantaneous value of AC voltage.
14. Define RMS value of AC.
15. What is a square wave?

One mark questions (Understanding):

1. How do you relate voltage and current in case of conductors?
2. How many electrons pass through a conductor in one second if the current through the Conductor is one ampere?
3. Can Ohm’s law be applicable when the temperature of a conductor continuously changes?
4. How do you arrange cells to get desired current rating?
5. How do you connect cells to obtain desired voltage rating?
6. Give an example for electro-chemical cell.
7. What do you mean by current source?
8. When will a load receives maximum power from a source?
9. Who invented modern alternating current electrical supply system?
10. RMS value has to be considered in case of AC. Why?
11. How much is the AC voltage supplied to all household electrical devices in India?
12. Mention any one type of battery used in mobile phones.

One mark questions (Application):

1. What will be the current flowing through an open circuit?
2. What will be the voltage across short circuit?
3. Write any one application of network theorem.
4. Mention one advantage of superposition theorem.
5. Mention an application of maximum power transfer theorem.
6. The output impedance of an amplifier is 8 Ω. What should be the input impedance of the loud speaker to hear the quality sound?

Two marks questions (Knowledge):

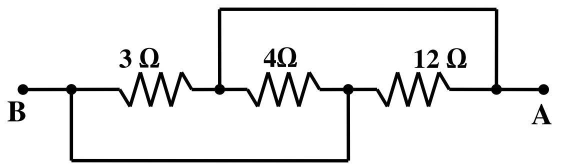
1. What is meant by a linear network? Give an example for linear device.
2. What is meant by a nonlinear network? Give an example for nonlinear device.
3. What will be the resistance in open circuit and short circuit?
4. State superposition theorem.
5. State Thevinin's theorem.
6. State KVL and KCL.
7. What are primary DC-sources? Give an example.
8. What are secondary DC-sources? Give an example.
9. Define 'branch' and 'loop' in an electrical circuit?
10. Define peak value and RMS value.
11. Define time period and frequency of AC?
12. Mention the unit of AC voltage and frequency.

Two marks questions (Understanding):

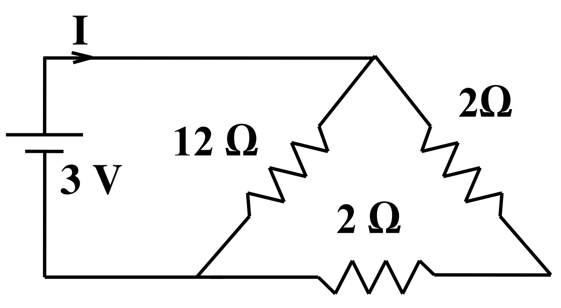
1. Give an example for primary and secondary batteries.
2. Give an example for AC and DC sources.
3. Distinguish between open and short circuit
4. Write the difference between voltage source and current source.
5. Compare ideal and practical voltage source.
6. What is the difference between conventional current and electron current?
7. Draw the V-I characteristics of a practical voltage source.
8. Why is DC not used for powering all houses?

Two marks questions (Application):

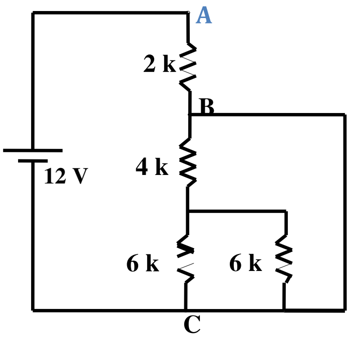
1. A bulb of a car head light is connected to a 12 V battery maintains 3 A of current. What is the power rating of the bulb? [Ans: 36 w]
2. Find the resistance between A and B. [Ans: 1.5 Ω]



3. The specifications of an iron box are labelled as 230 AC, 350 W. Calculate the resistance of the iron box. [Ans: 151 Ω]
4. Find the current 'I' in the circuit. Find the following:



5. For the circuit shown below determine
   a) Total resistance [R_T = 2 kΩ]
   b) Total current flowing in the circuit [I = 6 mA]



6. A 12 V battery allows 2 A of current through a resistor. What is the current in the same resistor if a 6 V battery is connected? [Ans: 1 A]
7. Calculate the current I flowing into the node N in the given circuit. [Ans: -2 mA]
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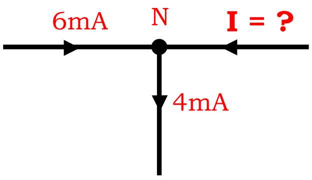


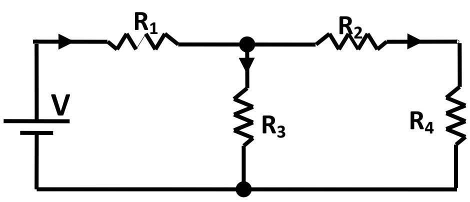
8. The angular frequency of a waveform is 100 π radian/sec.
   Find its a) frequency and b) time period. [Ans: 50 Hz, 20 mS]
9. The equation of an alternating voltage is given by v = 325sin (314t). Find the frequency and the RMS value of the voltage. [Ans: 50 Hz, 229.8 V]

Three marks questions (Knowledge):

1. Mention the properties of charges.
2. Mention any three limitations of Ohm's law.
3. What are primary and secondary batteries give an example for each.
4. Define the terms mesh, branch and loop in an electrical network.
5. Define the following terms in an ac signal
   a) Frequency b) Time period c) Peak Value
6. Briefly explain open circuit and short circuit with relevant circuit.

Three marks questions (Understanding):

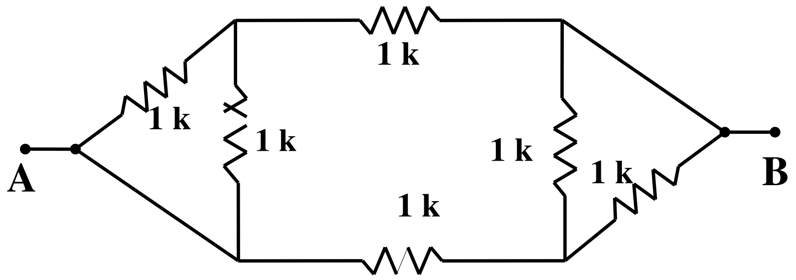
1. Give comparison between AC and DC.
2. Write any three differences between the Dry cell and Wet cell.
3. How to convert voltage source into current source, explain.
4. How to convert current source into voltage source, explain.
5. Find the number of branches, nodes and loops in the following circuit



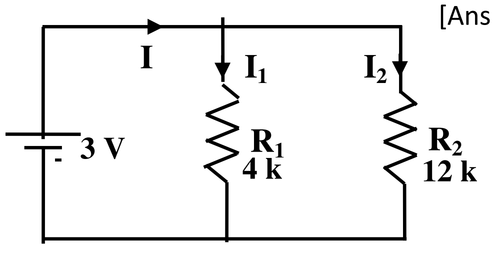
6. Explain voltage divider rule.
7. Explain current divider rule.
8. Draw any three non sinusoidal waveforms.

Three marks questions (Application):

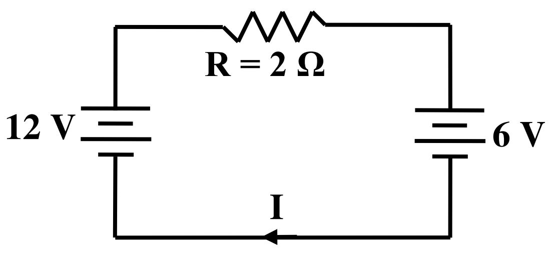
1. A battery is connected across a conductor. If it transfers 30 C of charge/S and the amount of work done by the battery is 90 joules/S, what is the battery voltage? [Ans: 3 V]
2. How do you create 3 V, 2 V and 1 V from a 3 V source?
3. An UPS supplies 2 A of current to a bulb of 20 V for 20 minutes. Calculate the amount of charge supplied by the UPS. [Ans: 2400 C]
4. Find the total resistance between A and B. [Ans: 0.75 kΩ]



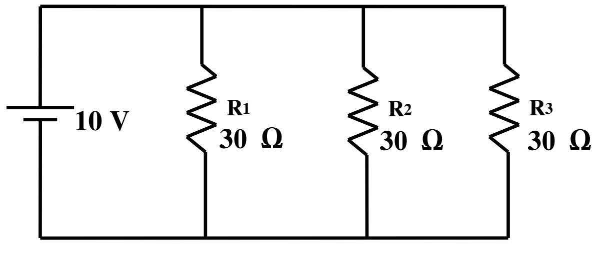
5. Find the total current flowing in the circuit also find the branch current? [Ans: I = 1 mA, I_1 = 0.75 mA, and I_2 = 0.25 mA]



6. Find the current flowing through and voltage across R using super position theorem. [Ans: V = 6 V, I = 3 A]



7. Find the total current and total resistance in the circuit given below. [Ans: I = 1 A, R_t= 10 Ω]

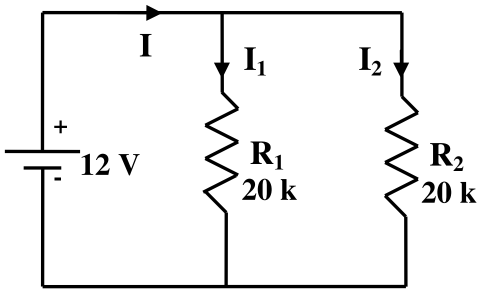


8. A 220 Ω resistor is connected to 220 V sinusoidal 50 Hz supply. Find the peak, rms and average values of the current and the power dissipated.

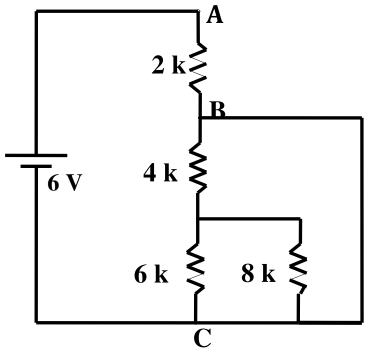
[Ans: V_P = 311 V, V_{rms} = 220 V, V_{avg} = 197.9 V]

9. Find the total current flowing in the circuit. Also find the branch current?

[Ans: I = 1.2 mA, $I_1 = I_2$ = 0.6 mA]

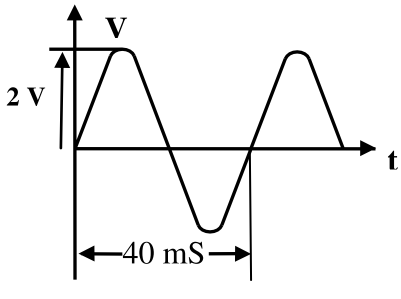


10. Find the following in the given circuit.
    (a) Voltage at A
    (b) Potential at B
    (c) Total current flowing in the circuit [Ans: V_A = 6V, V_B = 0 V, I = 3 mA]



11. A sinusoidal voltage varies from zero to a maximum value of 200 V. How much is its value at the instances of a) 30^0 b) 45^0 c) 90^0 [Ans: (a) 100 V (b) 141 V (c) 200 V]

12. Find V_m, $V_{p-p,}$ and frequency of the given waveform. [V_m =2 V, V_{p-p} = 4 V, f = 25 HZ]

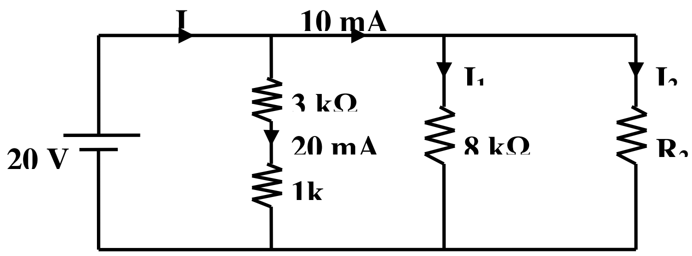


13. A 100 W electric bulb connected across a 230 V, 50 Hz power line. What is the rms and peak value of the current flowing through it? [Ans: Vp = 230 V, I_{rms} = 0.434 A , I_p= 0.613 A]

Five marks questions (Application):

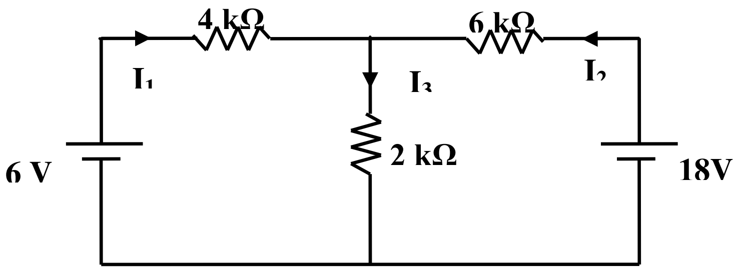
1. In the figure, determine the unknown branch currents and unknown resistance of resistors.

[Ans: R_2 = 2.66 kΩ, I_2 = 7.5 mA, I_2 = 2.5 mA I = 30 mA]



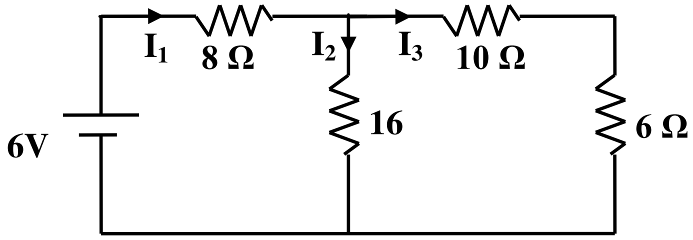
2. Determine the branch currents in the given figure.

[Ans : I_1 = -2.63 A , I_2 = 2.18 A , I_3 = -0.45 A]

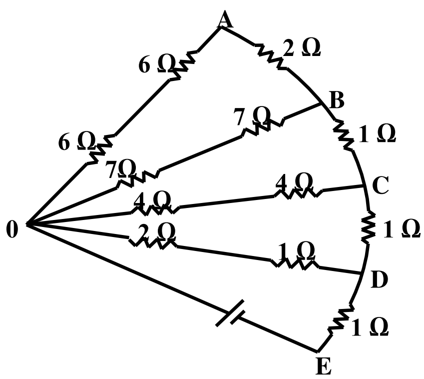


3. Determine the branch currents and voltage drops across each resistor.

[Ans : I_1 = 3/8 A , I_2 = 3/4 A , I_2 = 3/4 A]



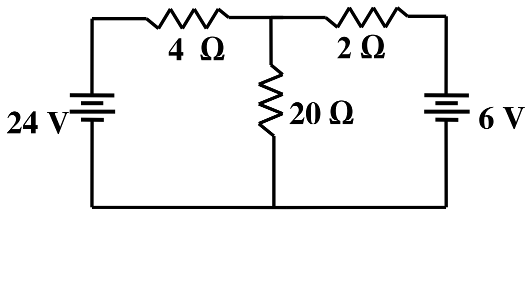
4. Find the total resistance between the terminals O and E in the figure shown below.



[Ans: R_t = 2.87 Ω]

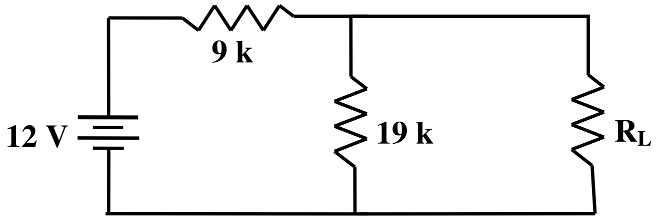
5. Using superposition theorem, find the current through the 20 Ω resistance of the circuit.

[Ans: 0.705 A]

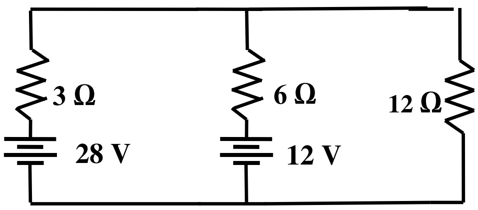


6. What should be the value of load R_L to abstract maximum power from 12 V batteries? Determine the power transferred to R_L.

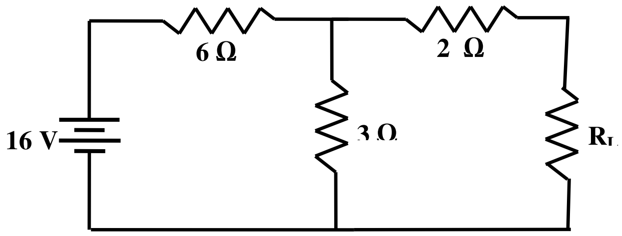
[Ans: $R_{th} = R_L = 6.1\ k\Omega$, $V_{th} = 8.14\ V$, $P_{max} = 2.71\ mW$]



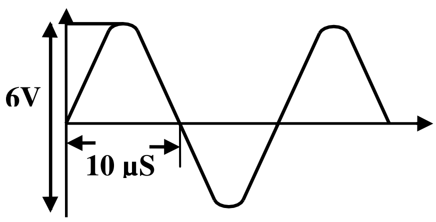
7. Use superposition Theorem to find the current through 12 Ω resistor. [Ans: 1.62 A]



8. According to Maximum Power transfer theorem, what should be the value of load resistance R_L to abstract maximum power from the 16 V battery as shown in figure below? What is the value of maximum power? [Ans: $R_{TH} = 4\ \Omega$, $P_{max} = 1.77\ W$]



9. Calculate V_m, V_{p-p}, V_{rms}, time period and frequency of the given waveform.



[Ans: Vp = 3 V, $V_{p-p} = 6\ V$, $V_{rms} = 2.1\ V$, $V_{AVG} = 1.91V$, T = 20 µS , f = 50 kHz]

Five marks questions (Knowledge):

1. State and explain KCL and KVL.
2. State and explain Thevenin's theorem with an example.
3. State and explain superposition theorem.
4. Define the following terms with respect to an ac signal

   a) Cycle b) RMS value c) Peak to peak value d) Average value e) Instantaneous voltage.

Five marks questions (Understanding):

1. Distinguish between DC and AC current.
2. Derive an expression for the effective resistance of two resistors connected in series.
3. Derive an expression for the effective resistance of two resistors connected in parallel.
4. State and explain maximum power transfer theorem with an example

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Chapter 3

Measuring Instruments

One mark questions (Knowledge):

1. What is an oscilloscope?
2. What is ECG?
3. What is sphygmomanometer?
4. Name the meter which is used to measure glucose present in human body?
5. What is a pulse oximeter?

One mark questions (Understanding):

1. How do you connect an ammeter in a circuit?
2. How do you connect the voltmeter in a circuit?
3. Name the meter which measures the physical quantity resistance.
4. Name the instrument which is use to measure current, voltage, resistance, etc.
5. Which instrument is used to measure the arterial blood pressure?

One mark questions (Application):

1. Can we check correctness of a diode using multimeter?
2. Is it possible to measure DC of 10 mV using CRO?
3. Write any one application of ECG.
4. Mention one application of Glucometer.
5. Mention one application of pulse oximeter.

Two marks questions (Knowledge):

1. Write the merits of multimeter.
2. Write the symbol of AC ammeter and DC Voltmeter.
3. Write the two important elements of a digital thermometer.
4. Explain the controls of multimeter.
5. Mention any four controls of CRO.

Two marks questions (Understanding):

1. Give an example for signal conditioner and transducer.
2. How digital thermometer work?

Two marks questions (Application):

1. What is CRO? Mention few applications of CRO.
2. What are the applications of glucometer and pulse oximeter?

Three marks questions (Knowledge):

1. Write the block diagram showing essential parts of electronic measuring instrument.
2. Explain Ohm meter.
3. List the precautions while using electronic instruments.

Three marks questions (Understanding):

1. Give details of various controls of multimeter.
2. Give details of front panel controls of CRO.
3. How DC voltage is measured using CRO.
4. Mention any three bio-medical electronic devices.

Three marks questions (Applications):

1. Explain how AC voltage, time period and frequency measured using CRO.
2. Write applications of multimeter.
3. Determine time period and frequency of AC. Given distance between two successive peaks on CRO screen is 4.0 divisions and time/division = 2 mS/division. Ans: T = 8 mS, f = 125 Hz
4. Determine peak voltage and rms voltage of AC. Given height of the trace from peak to peak on CRO screen is 4.0 divisions and volts/division = 5 V/division.

   Ans: V_p = 10 V, V_{rms} = 7.07 V

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Chapter 4

Passive electronic components

One mark questions (Knowledge):

1. What is a passive component?
2. What is an active component?
3. What is a resistor?
4. What is the unit of resistance?
5. What is ohms rating of a resistor?
6. Define temperature coefficient of a material.
7. Define specific resistance or resistivity.
8. Write the circuit symbol of variable resistor.
9. Write the circuit symbol of preset.
10. Name any one fixed resistor.
11. Name any one variable resistor.
12. What is a SMD resistor?
13. What is capacitance of a capacitor?
14. What is the unit of capacitance?
15. Write the circuit symbol of inductor.
16. What is electromagnetic induction?
17. What is the unit of self-inductance?
18. Write the circuit symbol of iron core inductor.
19. Write the circuit symbol of air core inductor.
20. Write the expression for energy stored in an inductor.
21. Write the mathematical expression for self-inductance.
22. What is a choke?
23. What is a relay?
24. What is a transformer?
25. Define turns ratio.
26. What is a step down transformer?
27. Expand NTC.
28. Expand PTC.
29. What is a transducer?
30. What is meant by pressure transducer?

One mark questions (Understanding):

1. Give one example for a passive component.
2. Give one example for an active component.
3. What does the fourth band of 4 band colour coded resistor indicate?
4. What does the fifth band of 5 band colour coded resistor indicate?
5. Write any one advantage of metal film resistor against carbon composition resistor.
6. What does the power rating of a resistor indicate?

7. Which type of capacitor is sensitive to polarities?
8. When is inductance said to be 1 Henry?
9. Which has more inductance, a coil with iron core or with air core?
10. Write the relation between turns ratio, voltage ratio and current ratio in a transformer.
11. Give one example for temperature sensor.
12. Which expression do you use to calculate the effective inductance when two inductors are connected in series?
13. Which expression do you use to calculate the effective inductance when two inductors are connected in parallel?
14. Write the unit for energy stored in an inductor?
15. Which type of inductor is used in radio frequency range?
16. What happens to the strength of secondary current with reference to primary current in a step down transformer?
17. Which principle of inductance is used in transformer?
18. What happens to the resistance of NTC thermistor, when its temperature is increased?

One mark questions (Application):

1. Draw the symbol of electrolytic capacitor.
2. What would be the current value in a capacitor when it is fully charged by DC-source?
3. How do you connect number of capacitors to obtain maximum capacitance value?
4. How do you connect number of capacitors to obtain minimum capacitance value?
5. Write the application of a speaker.
6. What is the resistance of a resistor when shorted?
7. What is the resistance of a capacitor when shorted?
8. What is the resistance of a resistor when open?
9. What is the resistance of a capacitor when open?
10. What is the resistance value of SMD resistor printed with the code 223? Ans: 22 kΩ
11. What for LM35 is used?
12. Draw the pin diagram of LM35.

Two marks questions (Knowledge):

1. Write any two specifications of resistor.
2. What are the factors on which resistance of the material depends?
3. Mention the factors on which the capacitance of a capacitor depends.
4. Write an expression for energy stored in a capacitor.
5. What is leakage current and leakage resistance in a capacitor?
6. Write any two specifications of an inductor.
7. List the factors on which self-inductance of a coil depend.
8. Write the principle of mutual inductance?
9. List the factors on which mutual-inductance of a coil depends.
10. Mention the different types of transformer based on the core used.

Two marks questions (Understanding):

1. Distinguish between active and passive components.
2. How to troubleshoot a capacitor?
3. Distinguish between self-inductance and mutual-inductance.
4. Explain the terms in the expression of mutual inductance of a coil.
5. How is energy stored in an inductor? Write its expression.
6. Write any two applications of chokes.
7. List the advantages of relays.
8. Write the specifications of relay.
9. How is the impedance behaviour of inductor towards AC and DC?
10. With an appropriate diagram, write the expression for inductors connected in series.
11. With an appropriate diagram, write the expression for inductors connected in parallel.
12. Write any two applications of transformer.
13. How step up transformer differs from step down transformer.
14. Why centre tapping is necessary?
15. Give two examples for pressure transducer.
16. Distinguish between speaker and microphone.

Two marks questions (Application):

1. The resistance of a coil made of copper wire is 100 Ω at 0 °C. Calculate its resistance at 30 °C. Given α = 0.004/°C. Ans: R_t = 112 Ω
2. Calculate the resistor value that has Brown-Black-Yellow-Gold colour bands. Ans: 100 kΩ ± 5%
3. Two capacitor plates each of effective area 6 x 10^{-4} m^2 are separated by 1.3 x10^{-3} meter. Find its capacitance. The space between the plates is filled with air. Ans: C = 4.086 pF
4. How much energy is stored in a 20 µF capacitor with a voltage rating of 15 volts? Ans: 2250 µJ
5. Write the applications of choke.
6. Write the applications of IF transformer.
7. Write the applications of LDR.
8. Determine the charge on 30 µF capacitor charged to 20 volt. Ans: 600 µC
9. Write the applications of AF transformer.
10. Write the applications of pulse transformer.
11. Write the applications of transformer.

Three marks questions (Knowledge):

1. Write a note on SMD resistor.
2. Write a note on presets.
3. Write a note on power rating of a resistor.
4. Write a note on trimmers.
5. Write the constructional features of ganged capacitor.
6. Write the constructional features of SMD capacitor.
7. Write a note on iron core inductor.

8. Write a note on ferrite core inductor.
9. Write a note on IF transformer.
10. Write a note on centre tapping in transformer.
11. Write a note on pulse transformer.
12. Write a note on thermistor.

Three marks questions (Understanding):

1. Explain the construction of carbon composition resistor.
2. Derive an expression for the equivalent capacitance of two capacitors connected in parallel.
3. Describe the construction of a ceramic capacitor.
4. Explain the role of dielectric in capacitor construction.
5. Explain the phenomenon of self-induction.
6. Explain the phenomenon of mutual induction.
7. Explain the construction of air core inductor.
8. How is a choke constructed? Explain.
9. With a circuit diagram, explain the working of an SPDT relay.
10. Define efficiency of a transformer. Write its expression.
11. Briefly explain the construction of pulse transformer.
12. Explain the principle of transformer.

Three marks questions (Application):

1. The resistance of a wire of length 1 m and of diameter 0.12 mm is 40 Ω. What is its specific resistance? Ans: 0.45216×10^{-6} Ωm
2. Two capacitors of capacitance 20 µF and 30 µF are connected in series across 200 V dc supply. Determine a) effective capacitance. b) total charge on combination.
   Ans: 12 µF, 2400 µC
3. Two capacitors of capacitance 60 µF each are connected in parallel. The combination is further connected in series with capacitor of 30 µF. Determine effective capacitance.
   Ans: 24 µF
4. A 2 cm long air core coil with cross sectional area of 3 cm^2 has 10 turns. Determine the inductance of the coil Ans: L = 1.88 µH
5. A 5 mH inductor is subjected to an electric current that changes at a rate of 5 A per second. How much voltage will be dropped by the inductor? Ans: 250 mV
6. Calculate the energy stored in the magnetic field of 100 mH inductor with a current of 80 mA.
   Ans: 320 µJ

Five marks questions (Applications):

1. Complete the following table for the carbon resistor R.

Sl.no.	I band	II band	III band	IV band	Value of R
1	Orange	Red	Red	Gold	
2					100K ± 10%
3	Brown	Black	orange	Silver	
4					47k ± 20%

Ans: (1) 3.2KΩ ± 5%

(2) Brown, Black, Yellow and Silver (3) 10KΩ ± 10% (4) Yellow, Violet, Orange and No colour.

2. Two capacitors of 60 µF each are connected in parallel. The combination is further connected in series with two capacitors of 30 µF and 75 µF. Calculate the total capacitance of the Circuit.

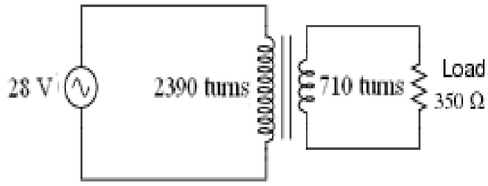
   Ans = 18.18 µF

3. Two capacitors of capacitance 10 µF and 30 µF are connected in series across 100 V dc supply. Determine a) effective capacitance b) the total charge on combination c) potential difference across each capacitor. Ans: (a) 7.5 µF (b) 750 µC (c)75 V, 25 V

4. A step down transformer having a power output of 10 KW and efficiency 90% reduces the voltage from 11 KV to 220 V. Calculate (i) the number of turns in the primary if the secondary has 100 turns and (ii) the current in the primary. Ans: 5000 and 0.909 A

5. Calculate the voltage output by the secondary winding of a transformer if the primary voltage is 220V, the secondary winding has 4000 turns; the primary winding has 400 turns. What is the turn ratio? Ans: 2200 V, 1:10

6. Calculate the load current and load voltage in this transformer circuit:



Ans: I_{load} = 23.77 mA, V_{load} = 8.318 V

Five marks questions (Knowledge):

1. Write the constructional features of electrolytic capacitor and mention its applications.
2. Describe the construction and working of a transformer.
3. Write a note on audio transformer and mention its applications.
4. Describe the construction and working of a moving coil loudspeaker.

Five marks questions (Understanding):

1. Explain the important specifications of resistor.
2. Explain the principle of capacitor.
3. Explain the construction of a polystyrene capacitor.
4. Derive an expression for the equivalent capacitance of three capacitors connected in series.
5. Derive an expression for the equivalent capacitance of three capacitors connected in parallel.
6. Explain the phenomenon of mutual-induction.
7. Explain the construction and working of microphone.
8. Explain the construction and working of LDR.
9. Explain the construction and working of a thermistor.

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Chapter 5

Application of DC and AC to passive components

One mark questions (Knowledge):

1. What is a transient period?
2. What is transient phenomenon?
3. Define time constant of RC circuit.
4. Define time constant of RL circuit.
5. What is a phase?
6. What is phase difference?
7. Write the unit of capacitive reactance.
8. What is inductive reactance?
9. Define average power.
10. Define reactive power.
11. Define apparent power.
12. Define power factor.
13. Define impedance.
14. What is the unit of impedance?
15. What is bandwidth?
16. What is low pass filter?
17. What is high pass filter?
18. Define quality factor.

One mark questions (Understanding):

1. What do you mean by transient response?
2. Give an expression for the voltage across capacitor during charging.
3. Give an expression for the voltage across capacitor during discharging.
4. Give an expression for the instantaneous current in RL circuit, during the growth of current.
5. Give an expression for the instantaneous current in RL circuit, during the decay of current.
6. Two AC quantities are in phase. What is the value of phase angle between them?
7. What do you understand by phase leading?
8. What do you understand by phase lagging?
9. Do you think resistance offered by the resistor is same for AC and DC?
10. Do you think resistance offered by the capacitor is same for AC and Dc?
11. Do you think resistance offered by the inductor is same for AC and Dc?
12. What do you mean by capacitive reactance?
13. Give an expression for the inductive reactance.
14. What do you mean by half power frequency?
15. How do you relate quality factor, bandwidth and resonance frequency?
16. Give an expression for the resonance frequency of a series resonance circuit.
17. Give the condition for the resonance of series RLC circuit.
18. Which expression do you use to calculate the impedance of series RLC circuit?
19. What is the phase difference between current and voltage in series RLC circuit?

20. What do you mean by filter?

One mark questions (Application):

1. Draw the phasor diagram of voltage and current in a purely resistive circuit.
2. Draw the phasor diagram of voltage and current in a purely capacitive circuit.
3. Draw the phasor diagram of voltage and current in a purely inductive circuit.
4. Draw the waveform of two in phase AC quantities.
5. Draw the waveform of two AC quantities that are 180^0 out of phase.
6. Sketch the phasor diagram of two AC quantities that are 90^0 out of phase.
7. Give the expression for phase angle between current and voltage in series RLC circuit?
8. Sketch frequency response curve of high-pass filter.

Two marks questions (Knowledge):

1. What is the frequency of DC? Name any one DC source.
2. Write expressions for instantaneous voltage and currents for an AC circuit containing pure capacitor.
3. Write expressions for instantaneous voltage and currents for an AC circuit containing pure inductor.
4. What is capacitive reactance and give the expression for the capacitive reactance.
5. Write a brief note on impedance of a circuit.

Two marks questions (Understanding):

1. What happen to the power for purely reactive circuit with voltage and current at 90^0 out of phase?
2. Describe the phenomenon of resonance in a series resonance circuit.
3. Define inductive reactance and give the expression for the inductive reactance.
4. Define capacitive reactance and give the expression for the capacitive reactance.
5. Derive an expression for resonance frequency of series resonance circuit.

Two marks questions (Applications):

1. Draw the graph showing voltage across capacitor during charging in CR circuit.
2. Draw the graph showing voltage across capacitor during discharging in CR circuit.
3. Draw the graph showing growth of current in RL circuit.
4. Determine the time constant of an RC circuit when R = 22 kΩ and C = 0.05 µF.

   Ans: τ = 1.1 mS
5. Determine the time constant of an RL circuit when R = 100 Ω and L = 100mH. Ans: τ = 1 mS
6. The time constant of an RL circuit is 4 mS, if L = 100 mH, calculate the value of resistance.

   Ans: R = 25 Ω
7. The time constant of an RL circuit is 1 µS, if R = 20 kΩ, calculate the value of inductance.

   Ans: L = 20 mH
8. Draw the circuit diagram of low pass filter and high pass filter.

Three marks questions (Knowledge):

1. Write a note on AC applied to pure resistive circuit.
2. Write a note on AC applied to pure capacitive circuit.
3. Write a note on AC applied to pure inductive circuit.
4. What are the advantages of phasor diagram

Three marks questions (Understanding):

1. Discuss the charging of capacitor in RC circuit.
2. Discuss the discharging of capacitor in RC circuit.
3. Discuss the growth of current in RL circuit.
4. Discuss the decay of current in RL circuit.

Three marks questions (Application):

1. Determine the current through an inductor during the growth at t = 1 S in a DC circuit containing R = 1 Ω and L = 1 H connected to DC supply of 20 V. Ans: 12.64 A
2. Determine the voltage across the capacitor and maximum current during charging at t = 1 S in a DC circuit containing R = 1 MΩ and C = 1 µF connected to DC supply of 10 V.
   Ans: V_c = 6.32 V, I_o = 10 µA
3. What is the reactance of a 3 mH inductor connected to an AC of 200 V, 120 Hz?
   Ans: 2.261 Ω
4. A 2.5 mH inductor is placed in a circuit, where the frequency is 100 kHz and voltage is 50 V. Calculate Inductive reactance and peak current? Ans: X_L = 1570 Ω, I_m = 31.84 mA
5. What is the capacitive reactance of a 0.01 µF capacitor at 400 Hz? Ans: X_C = 39.8 kΩ
6. An inductor of 20 mH is connected in series with a resistor of 50 Ω. The combination is connected to 220 V, 50 Hz source. Find the current in the circuit. Ans: I = 4.36 A
7. A series RLC circuit has R = 20 Ω, C = 0.01 µF, L = 10 mH. Calculate resonant frequency.
   Ans: f_c = 15.9 kΩ

Five marks questions (Application):

1. A coil of 100 mH having a resistance of 100 Ω is connected across a source of 200 V, 50 Hz. Find the phase angle and current in the circuit. Ans: $\phi = 17.43^o$, I = 1.9A
2. A 10 Ω resistance in series with X_L = 50 Ω and X_C = 25 Ω. The applied voltage is V = 50 mV with 50 Hz. Calculate Z, I and phase angle. Ans: Z = 26.92 Ω, I = 1.85 mA, $\phi = 68.19^o$

Five marks questions (Knowledge):

1. Discuss charging and discharging of capacitor in a RC circuit.
2. Discuss the growth and decay of current in a RL circuit.

Five marks questions (Understanding):

1. Derive an expression for impedance in a series RLC circuit.
2. Explain low pass filter with its frequency response
3. Explain high pass filter with its frequency response

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Chapter 6

Semiconductors, diodes and applications of diodes

One mark questions (knowledge):

1. What are conductors?
2. What are semiconductors?
3. Define valance band.
4. Define conduction band.
5. Name the majority charge carriers in n-type semiconductor.
6. Name the majority charge carriers in p-type semiconductor.
7. What is forbidden energy gap?
8. What is doping?
9. Name any one acceptor impurity.
10. Name any one donor impurity.
11. What is the value of potential barrier of a silicon diode?
12. Write the symbol of a p-n junction diode.
13. What is the static resistance of a diode?
14. Define dynamic resistance of a junction diode.
15. What is reverse saturation current?
16. Mention the Shockley's equation for diode.
17. What is an ideal diode?
18. What is clipping circuit?
19. What is a clamper?
20. What is rectification?
21. What is a rectifier?
22. What is the function of a filter in rectifier circuit?
23. What is a Zener diode?
24. Write the schematic symbol of a Zener diode.
25. Define Zener breakdown voltage.
26. Mention the main application of Zener diode.
27. What is line regulation?
28. What is load regulation?
29. What is LED?
30. What is a varactor diode?
31. Write the symbol of a varactor diode.
32. What is an infrared LED?
33. Write the symbol of an IR LED.
34. Name any one application of an IR LED.
35. What is a photodiode?
36. Write the symbol of a photodiode.
37. Write any one application of a photodiode.
38. What is a tunnel diode?
39. Write the symbol of a tunnel diode.

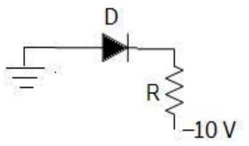
40. What is a Schottky diode?
41. Mention any one application of Schottky diode.
42. Mention any one application of a seven segment display.
43. Expand LCD.
44. Name the IC regulator used to construct +12 V fixed voltage regulator.
45. Name the IC regulator used to construct adjustable positive voltage regulator.

One mark questions (Understanding):

1. How p-n junction is formed?
2. What is meant by depletion region?
3. What do you mean by potential barrier?
4. What is meant by biasing a p-n junction?
5. What is meant by forward biasing?
6. What do you mean by reverse bias?
7. What is the effect of forward bias on the width of a p-n junction?
8. What is the effect of reverse bias on the width of a p-n junction?
9. Is reverse saturation current depends on temperature?
10. What do you mean by junction breakdown?
11. Give the expression for transition capacitance.
12. Write the equivalent circuit of a reverse biased ideal diode.
13. Write the equivalent circuit for second approximation of a diode.
14. Write the equivalent circuit for third approximation of a diode.
15. What is the power rating of a diode?
16. What is the importance of peak inverse voltage?
17. What is the value of ripple factor in half wave rectifier?
18. In what respect Zener diode is different from an ordinary diode.
19. Name the active component used for voltage regulation.
20. Under which bias LED is operated?
21. During which process light is emitted from LED?
22. Under which biasing condition is a varactor diode operated?
23. In what bias condition is a photodiode normally operated?
24. Name any one application of tunnel diode.

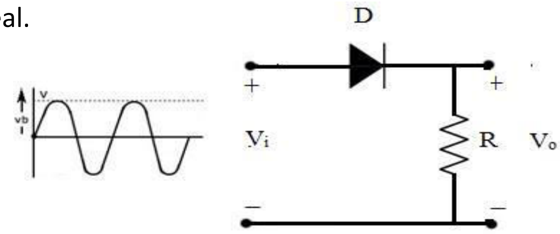
One mark questions (Application):

1. Draw the equivalent circuit of a forward biased ideal diode.
2. In the figure shown, is the diode D forward or reverse biased?

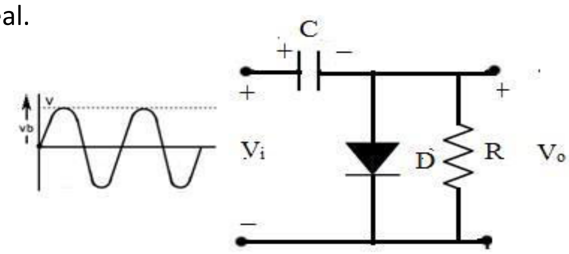


3. In which type of bias, the p-n junction diode resistance is high?

4. Sketch the shape of the output voltage waveform for the circuit shown below assuming the diode to be ideal.



5. Sketch the shape of the output voltage waveform for this circuit shown below assuming the diode to be ideal.



6. Determine average DC voltage of HWR. Given V_m = 9V. Ans: V_{av} = 2.86 V
7. Name any one application of a varactor diode.
8. Draw the equivalent circuit of a Zener diode.
9. Draw the symbol of a Schottky diode.
10. Draw the schematic symbol of LED.

Two marks questions (Knowledge):

1. Classify extrinsic semiconductor.
2. Mention majority and minority charge carriers in n-type semiconductor.
3. Draw the crystalline structure of a p-type semiconductor.
4. Mention the typical values of knee voltage for Ge and Si diodes.
5. Define ideal diode. Draw its V-I characteristics.
6. Mention any two applications of a diode.
7. Mention wave shaping circuits.
8. What is clipping circuit? Mention any one application of clipping circuit.
9. What is clamping circuit? Mention any one application of clamping circuit.
10. Write the circuit of series positive clipper and show the input and output waveforms.
11. Write the circuit of series negative clipper and show the input and output waveforms.
12. Write the circuit of positive clamper and show the input and output waveforms.
13. Write the circuit of negative clamper and show the input and output waveforms.
14. Define ripple factor and give its significance.
15. Write the circuit diagram of a full wave rectifier along with the input and output wave forms.
16. What are the values of rectification efficiency of a full wave rectifier and half wave rectifier?
17. What is Zener break down?
18. What is voltage regulation? Mention the types of voltage regulation.
19. Write any two application of LED.
20. Mention any two applications of LCD.

Two marks questions (Understanding):

1. Explain the phenomenon of diode reverse breakdown.
2. What do you mean by the transition capacitance of a diode?
3. A p-n junction diode is a non linear element. Explain.
4. Distinguish between Ge and Si diode.
5. Explain the second approximation of a semiconductor diode.
6. Explain the third approximation of a semiconductor diode.
7. Distinguish between positive and negative clipper?
8. What is the difference between positive and negative clamper?
9. How many diodes are used in a (i) Centre tapped full wave rectifier and (ii) Bridge rectifier?
10. Distinguish between full wave rectifier and half wave rectifier.
11. Distinguish between series inductor filter and shunt capacitor filter.
12. Explain the need of a voltage regulator circuit in a power supply.

Two marks questions (Application):

1. Draw the lattice structure of silicon.
2. Draw the circuit diagram of a forward biased p-n junction diode.
3. Draw the circuit diagram of a reverse biased p-n junction diode.
4. A silicon diode has a bulk resistance of 1.5 Ω and a forward current of 10 mA. What is the forward voltage drop across the diode? Ans: 0.715 V
5. Draw the VI Characteristics of Zener diode.
6. Draw the circuit diagram of +12 V voltage regulator.
7. Draw the circuit diagram of an adjustable voltage regulator.
8. Draw the diagram of seven segment LED display.

Three marks question (Knowledge):

1. Classify solids based on energy band diagram.
2. Write the properties of semiconductor.
3. Briefly explain n-type semiconductors.
4. Briefly explain p-type semiconductors.
5. Write a note on diode junction capacitance.
6. Write a note on diode specifications.
7. Write a note on diode approximations.
8. Write a note on fixed positive regulator.

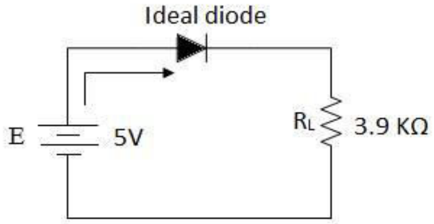
Three marks questions (Understanding):

1. How is the depletion region formed in a p-n junction?
2. Explain the working of a p-n junction when it is forward biased.
3. Explain the action of series positive clipper.
4. Explain the action of series negative clipper.
5. Explain the working of positive clamper.
6. Explain the working of negative clamper.
7. Explain the working of a p-n junction when it is reverse biased.

8. Explain the working of LED.
9. Explain common anode type of seven segment display.
10. Compare LED display with LCD display.

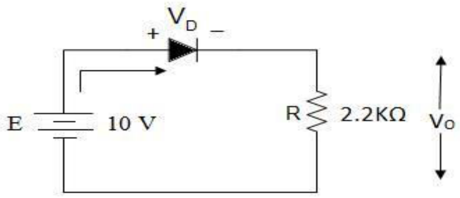
Three marks questions (Application):

1. A silicon diode dissipates 2.5 W for a forward current of 1.5 A. Determine the forward voltage drop across the diode and its bulk resistance. Ans: V_F = 1.66 V, R_B = 0.64 Ω
2. Calculate the load voltage and load current for the circuit shown.



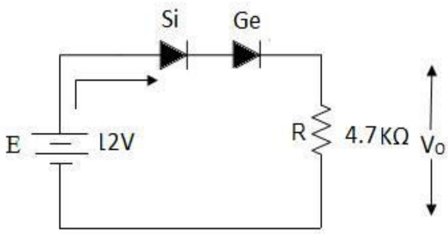
Ans: V_L = 5 V, I_L = 1.28 mA

3. A silicon diode is used in the circuit shown in figure. Determine V_D, V_R and I_D.



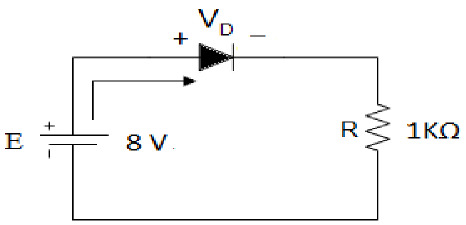
Ans: V_D = 0.7 V, V_R = 9.3 V and I_R = 4.22 mA

4. For the series diode configuration shown in figure, determine the current I_D and V_R.



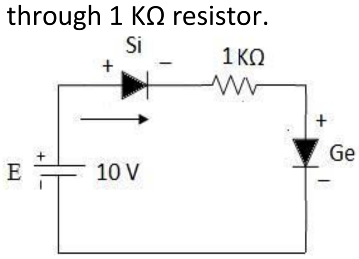
Ans: V_R = 11 V, I_R = 2.34 mA

5. Find the value of an applied voltage for Si diode having bulk resistance 25 Ω and a forward current of 2 mA. Ans: 0.75 V
6. A germanium diode is used in the circuit shown in figure. Determine V_D, V_R and I_D.



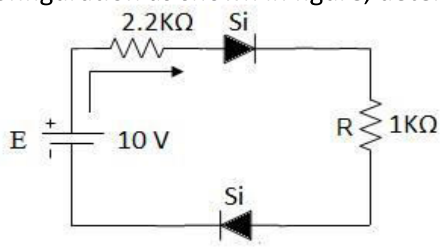
Ans: V_D = 0.3 V, V_R = 7.7 V, I_D = 7.7 mA

7. Determine the current through 1 KΩ resistor.



Ans: 9 mA

8. For the series diode configuration as shown in figure, determine the value of current through the circuit.



Ans: 2.60 mA

9. In a power supply the DC output voltage drops from 65 V with no load to 60 V at full load. Calculate the percentage voltage regulation Ans: 7.69%

10. Ideal diodes are used in constructing a centre tapped full wave rectifier circuit. An ac 200 V, 50 Hz applied across a transformer. If N_p= 500 turns, N_{s1} = N_{s2} = 150 turns and R_L = 1 kΩ, Calculate rms values and DC values of the current and voltage.

Ans: V_{rms} = 60 V, I_{rms} = 0.06 A, V_{dc} = 54.04 V, I_{dc} = 0.054 A

Five marks questions (Application):

1. A half wave rectifier uses a diode with a forward resistance of 50 Ω. If the input ac voltage is 200V rms and the load resistance is of 1 kΩ, determine

(i) I_m (ii) I_{dc} (iii) I_{rms} (iv) Ripple factor (v) Rectification efficiency

Ans: I_m = 0.269 A, I_{dc} = 0.085 A, I_{rms} = 0.134A, ϒ = 1.21, η = 38.32 %

2. The load resistance of a full wave rectifier is 500 Ω and the transformer secondary voltage is 80sinωt. Assume the diodes to be an ideal, determine the following: (i) rms values of voltage and current (ii) average values of voltage and current (iii) efficiency of rectifier and (iv) ripple factor.

Ans: V_{rms} = 56.57 V, I_{rms} = 0.113 A, V_{dc} = 50.92 V, I_{dc} = 0.102 A, η = 81.2%, ϒ = 0.48

3. A single phase full wave rectifier uses two diodes with the internal resistance of each being 120 Ω. The transformer rms secondary voltage from the centre to each end of secondary is 30 V and load resistance is 200 Ω. Determine (i) rms value of voltage and current and (ii) average value of voltage and current (iii) ripple factor and (iv) efficiency of rectifier.

Ans: V_{rms} = 30 V, I_{rms} = 0.141 A, V_{dc} = 27.03 V, I_{dc} = 0.135 A, ϒ = 0.48, η = 80.66 %

4. A 230 V, 50 Hz AC voltage is applied to the primary of 5:1 step down transformer, which is used in bridge rectifier, having a load resistance of 100 Ω. Assuming the diodes to be an ideal, determine the following:

(i) DC output current (ii) DC output voltage (iii) DC power delivered to the load and (iv) PIV of each diode.

Ans: I_{dc} =0.41 A, V_{dc} = 41.4 V, P_{dc} = 16.8 W, PIV = 130.1 V

5. A centre tapped transformer has a 230 V primary winding and a secondary winding rated at 15 V-0-15 V and is used in a full wave rectifier circuit with a load of 120 Ω. What is the dc output voltage, dc load current and the PIV rating required for diodes?

Ans: V_{dc} =13.5 V, I_{dc} = 0.11 A, PIV = 42.43 V

6. For the Zener diode voltage regulator with V_S = 20 V, R_S = 100 Ω, V_Z = 12 V, R_L = 680 Ω, determine

a. Load voltage

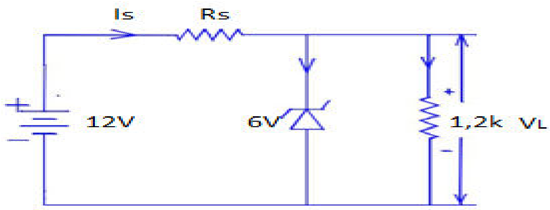
b. Voltage drop across series resistance R_s

c. Current through the Zener diode

Ans: $V_L = V_Z = 12$ V, $V_{RS} = 8$ V, $I_Z = 62.35$ mA

7. Calculate the load current and Zener diode current if $V_Z = 6$ V. Given $V_S = 25$ V, $R_S = 1.5$ kΩ and $R_L = 2$ kΩ. Ans: $I_L = 3$ mA, $I_Z = 9.6$ mA
8. In the circuit shown in fig. find the value of series resistance R_S, if Zener current is 10 mA.

Ans: Rs = 400 Ω



Five marks questions (Knowledge):

1. Classify solids based on energy band diagram.
2. Draw and explain the V-I characteristics of a p-n junction diode.
3. Explain the working of full wave centre tapped rectifier.
4. Explain the working of half-wave rectifier.
5. Explain the operation of bridge rectifier.
6. Explain the negative voltage rectifier.
7. Explain the working of a series inductor filter.
8. Explain the working of a shunt capacitor filter.

Five marks questions (Understanding):

1. How do you draw the forward and reverse characteristics of a semiconductor diode.
2. Explain the characteristics of a Zener diode.
3. Discuss the working of a Zener diode as a voltage regulator.
4. Explain the regulated +12 V DC power supply.
5. Describe the regulated -12 V power supply.

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Chapter 7

Bipolar Junction Transistor

One mark questions (Knowledge):

1. What is an unbiased transistor?
2. What is a biased transistor?
3. Write the symbol of an npn transistor.
4. Write the symbol of a pnp transistor.
5. Name the majority charge carriers in npn transistor.
6. Name the minority charge carriers in npn transistor.
7. What is the function of base region in a transistor?
8. What is the function of collector region in a transistor?
9. Mention the function of the emitter region in a transistor.
10. Write the physical structure of pnp transistor.
11. Write the expression showing relation between I_B, I_C and I_E of transistor.
12. Define α_{dc} of a transistor.
13. Define β_{dc} of a transistor.
14. What is an opto-coupler?
15. Write the symbol of phototransistor.
16. Write one application of phototransistor.
17. Write the symbol of IR transistor.
18. Write one important application of a transistor.
19. Write an expression showing the relation between α and β.
20. Mention any one operating region of a transistor.

One mark questions (Understanding):

1. Why is transistor called transfer resistor device?
2. Which region of the transistor is heavily doped?
3. Which region of the transistor is moderately doped?
4. Which region of the transistor is physically larger?
5. Which region of the transistor is physically narrow?
6. What does the arrow in the circuit symbol of a transistor indicate?
7. Why collector region is made larger?
8. How many pn junctions a transistor has?
9. Which operating region of a transistor is suitable for amplification?
10. Which operating region of a transistor is suitable for switching action?
11. In which mode of operation the transistor can be used as a switch?

One mark questions (Application):

1. For a transistor $I_C = 6$ mA and $I_E = 6.35$ mA, find I_B. Ans: $I_B = 0.35$ mA
2. Find the value of β, if $\alpha = 0.99$. Ans: $\beta = 99$
3. A transistor has $\beta = 100$. What is the value of α? Ans: $\alpha = 0.99$

4. An npn transistor has a DC current gain β of 200. Calculate the base current I_B when the collector current is 4 mA. Ans: I_B= 0.02 mA

Two marks questions (Knowledge):

1. What are the biasing conditions of a transistor to operate in active region and cut off region?
2. Define α_{dc} of a transistor and write the expression.
3. Define β_{dc} of a transistor and write the expression.
4. State different configurations of a transistor.
5. What is an opto-coupler? Mention one application.
6. What is an IR transistor? Write its circuit symbol.
7. Write any two application of IR transistor.
8. Write the circuit symbol of IR receiver. Mention its one application.
9. What is a phototransistor? Write its circuit symbol.
10. Write any two application of phototransistor.

Two marks questions (Understanding):

1. Distinguish doping levels of emitter and base in a transistor.
2. Why is the collector of transistor made larger and moderately doped?
3. Distinguish between α_{dc} and β_{dc}.
4. Obtain the relation between α and β of a transistor.
5. Distinguish between cut-off region and saturation region.

Two marks questions (Application):

1. In a transistor circuit, I_E = 5 mA and I_B is 1 μA. Find a value of I_C and α.
   Ans.: I_C = 4.995 mA, α = 0.999
2. For a transistor I_C = 6 mA and I_E = 6.35 mA, Find β.
   Ans.: I_B = 0.35 mA, β = 17.14
3. A transistor has α = 0.98. If I_C = 6 mA, Find I_B.
   Ans.: I_B = 0.122 mA
4. A transistor has α = 0.9, if I_E = 10 mA, calculate the values of I_C and β.
   Ans.: I_C = 9mA, β = 9
5. In a transistor the base current and collector current is 60μA and 1.75mA respectively. What will be the emitter current? Calculate the values of α of a transistor.
   Ans.: I_E = 1.75 mA, α = 0.967
6. A transistor has β = 150. Calculate the approximate collector and base currents if the emitter current is 12 mA. Ans.: α = 0.993, I_C = 11.916 mA, I_B = 0.084 mA
7. A transistor amplifier connected in CE mode has β = 100 and I_B= 50 μA, calculate the values of I_C and α. Ans.: I_C = 5 mA, α = 0.99
8. A transistor has α = 0.9, if I_E = 10 mA, calculate the values of I_C and β.
   Ans.: I_C = 9 mA, β = 9
9. In a transistor the base current and collector current are 60 μA and 1.75mA respectively. What will be the emitter current? Calculate the values of β of a transistor.
   Ans.: I_E = 1.75 mA, β = 29.17

10. A transistor connected in CE mode has β = 100 and I_B = 50 µA, calculate the values of I_C, I_E.

Ans.: I_C = 5 mA, I_E = 5.05 mA

11. A transistor has I_B = 105 µA and I_C = 2.05 mA. Find β and α of the transistor.

Ans.: β = 19.5, α = 0.95

12. If α for a transistor is 0.99, the base current is 100 µA, estimate the collector current.

Ans.: β = 99, I_C = 9.9 mA

13. A Transistor connected in CE mode has β = 80 and I_C = 5 mA. Calculate I_E.

Ans: I_B = 0.0625 mA, I_E = 5.0625 mA

Three marks questions (Knowledge):

1. Explain is the doping levels and physical sizes of emitter, base and collector layers.
2. List the different types of transistor configuration with necessary circuit diagram.
3. Define DC current gain in CB mode (α_{dc}), DC current gain in CE mode (β_{dc}) and Output resistance (R_o) in CE mode.
4. Describe with the diagram, the input characteristics of an npn transistor for CE configuration.
5. Briefly describe the different regions of output characteristics of transistor in CE mode.
6. What is a phototransistor? Write the circuit symbol and one application of a phototransistor.

Five marks questions (Understanding):

1. Explain with the diagram the construction and working of an npn transistor.
2. Distinguish between the different types of transistor configurations with necessary circuit diagram.
3. Distinguish between the active, saturation and cut-off regions of a transistor.
4. Explain how the input and output characteristics of an npn transistor in CE mode are drawn.
5. Briefly explain the working of the phototransistor. Write the circuit symbol and output characteristics of phototransistor.

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Chapter 8

Digital Electronics

One mark questions (Knowledge):

1. What is a digital signal?
2. Define the radix or base of a number system.
3. What is the base of binary number system?
4. What is a bit?
5. What is a nibble?
6. What is a byte?
7. What is a word?
8. Expand MSB?
9. Expand LSB?
10. What is a positive logic?
11. What is a negative logic?
12. What is the purpose of 1's and 2's complement of a binary number system?
13. What is a logic gate?
14. What is a basic gate?
15. Name any one basic gate?
16. What is an OR gate?
17. What is an AND gate?
18. Write the truth table of an OR gate.
19. Write the truth table of an AND gate.
20. Write the circuit symbol of NOT gate.
21. Write the truth table of NOT gate.
22. Write the Boolean expression of NAND gate.
23. Write the Boolean expression of two inputs NAND gate.
24. Write the Boolean expression of two inputs NOR gate.
25. Write the circuit symbol of NAND gate.
26. Write the truth table of a NAND gate.
27. Write the truth table of a NOR gate.
28. Write the logic symbol of NOR gate.
29. Mention any one type of pulse generator.
30. Write the expression for frequency of astable multivibrator.

One mark questions (Understanding):

1. Give the size of 1k Byte memory.
2. How many distinct symbols are there in base 2number system?
3. How many distinct symbols are there in base 16 number system?
4. How is 2's complement of a binary number obtained?
5. How do you represent a logic diagram using basic gates for the Boolean expression,

$$Y = \overline{A} + \overline{B}?$$

One mark questions (Application):

1. Convert 85_{10} to binary number. Ans: 1010101_2
2. Convert 1001_2 into decimal number. Ans: 9_{10}
3. Convert $5DC_{16}$ into binary number. Ans: $0101\ 1101\ 1100_2$
4. Obtain the decimal equivalent of the binary number 101_2. Ans: 5_{10}
5. Convert the given hexadecimal number $AD2_{16}$ to binary number. Ans.: $1010\ 1101\ 0010_2$
6. Convert the number 11111000_2 to hexadecimal number. Ans: $F8_{16}$
7. Convert the given number $(238)_{10}$ to hexadecimal number. Ans: EE_{16}
8. Obtain the 1's complement of the binary number 110011. Ans: 001100_2
9. Find the 2's complement of the binary number 10101011. Ans: 01010101_2
10. Add 110111_2 and 1101_2. Ans: 1000100_2
11. Perform binary division 10010_2 by 11_2. Ans: 110_2
12. Perform the binary addition for the numbers 110001 and 100001. Ans: 1010010_2
13. Subtract $111100_2 - 11100_2$. Ans: 100000_2
14. Perform binary multiplication 1011_2 and 110_2. Ans: 1000010_2
15. Prove that AB+A = A.
16. Prove that $AB+A\overline{B} = A$.
17. Simplify the expression $Y = (\overline{A}+B)\ (A+B)\ (A+1)$ using Boolean laws. Ans: Y = B

Two marks questions (Knowledge):

1. Distinguish between the digital and analog signals.
2. Write the circuit diagram of a transistor NOT gate.
3. Represent the truth table of NAND gate.
4. Write circuit diagram of DTL NAND gate.

Two marks questions (Understanding):

1. How is a bit represented? Give an example.
2. How is a nibble represented? Give an example.
3. How is a byte represented? Give an example.
4. How do you represent the Boolean expression and truth table of NOR-gate?
5. Why is NAND gates called as DTL circuit? Write its logic circuit.
6. Which gates are called Universal gates? Why they are called so?

Two marks questions (Application):

1. Draw the timing diagram of OR gate.
2. Draw the timing diagram of AND gate.
3. Draw the timing diagram of NOT gate.
4. Draw the timing diagram of NAND gate.
5. Draw the timing diagram of NOR gate.
6. Find the Binary equivalent of $(DADA)_{16}$? Ans: $1101\ 1010\ 1101\ 1010_2$
7. Obtain the decimal equivalent and hexadecimal equivalent of the binary number $(111101)_2$.
   Ans: Decimal Number=61_{10} Hexadecimal Number = $3D_{16}$
8. Convert $(AD)_{16}$ into binary and then to decimal system.
   Ans: Binary Number = $1010\ 1101_2$ Decimal Number = 173_{10}
9. Convert the given hexadecimal number $(DAC)_{16}$ to binary number and then to decimal number.

Ans: Binary = 1101 1010 1100_2 Decimal = 3500_{10}

10. Convert the given number $(87)_{10}$ to hexadecimal number and then to binary number.

Ans: Hexadecimal Number = 57_{16} Binary Number = 0101 0111_2

11. Obtain the 1's and 2's complement of the binary number 101010101_2.

Ans: 1's complement = 010101010_2 2's complement = 010101011_2

12. Prove that $\overline{A}$B+A = A+B.
13. Prove that A+ BC = (A+B) (A+C).
14. Prove that A (A+B) = A.
15. Prove that $AB + BC + \overline{B}C = AB + C$
16. Simplify the Boolean expression $Y = A + \bar{A}B + AB$. Ans: Y = $\overline{A}$ + B

Three marks questions (Knowledge):

1. State and prove De-Morgan's Theorems.
2. State and prove De-Morgan's Theorem with the truth table and logic circuit.
3. Draw the circuit and truth table of two input diode OR gate.
4. Draw the circuit and truth table of two input diode AND gate.
5. Draw the circuit and the truth table of transistor NOT gate.

Three marks questions (Understanding):

1. Prove that A+BC = (A+B) (A+C).
2. Prove that $A + \overline{A}B = A + B$.
3. With the circuit diagram write the truth table of DTL NAND gate.
4. With the circuit diagram write the truth table of DTL NOR gate.
5. Briefly explain the circuit diagram of Monostable Pulse Generator.
6. Briefly explain the circuit diagram of Astable Multivibrator.

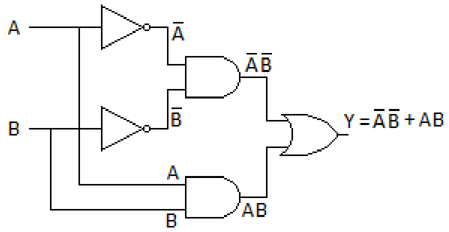
Five marks questions (Application):

1. Subtract 27_{10} from 56_{10} using 1's complement. Ans: 11101_2
2. Subtract 28_{10} from 78_{10} using 1's complement. Ans: 0110010_2
3. Subtract 34_{10} from 65_{10} using 2's complement. Ans: 0011111_2
4. Subtract 10000_2 from 111110_2 using 2's complement. Ans: 101110_2
5. Simplify the following expression, a) Y = $(\overline{A + B})$ $(\overline{A}+\overline{C})$ $(\overline{B}+C)$ b) Y = (A+$\overline{B}$C) (A$\overline{B}$ +C)

   Ans: a) Y = $\overline{A}\overline{B}$ b) Y = A$\overline{B}$ + AC + $\overline{B}$C
6. Simplify the following Boolean expression and draw the logic diagram for the simplified expression,

$$Y = \overline{\overline{A}B + A\overline{B}}$$

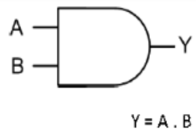
Ans: a) Y =$\overline{A}\overline{B}$ + AB



7. Simplify the given Boolean expression and draw the logic circuit for the simplified answer.

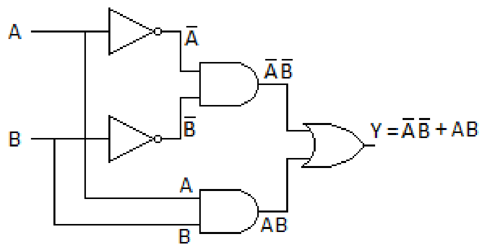
$Y = AB + ABC + AB\bar{C}$.

Ans: $Y = A.B$



8. Simplify the given Boolean expression and draw the logic circuit for the simplified answer Y = $\overline{A\bar{B} + \bar{A}B}$.

Ans: Y = $\bar{A}\bar{B}$ + AB



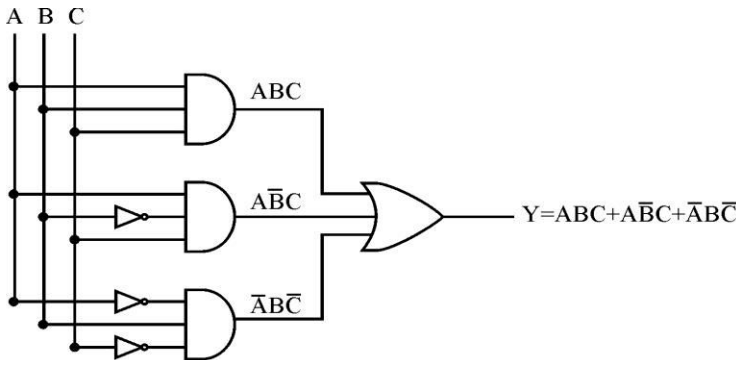
9. Simplify the Boolean expression Y = $AB + A(\overline{B + C})$. Ans: Y = AB + A$\bar{C}$

10. Simplify the given Boolean expression using De-Morgans' theorem, $Y = \overline{(\overline{AB}.A).(\overline{AB}.B)}$.

Ans: Y = A$\bar{B}$+$\bar{A}$B

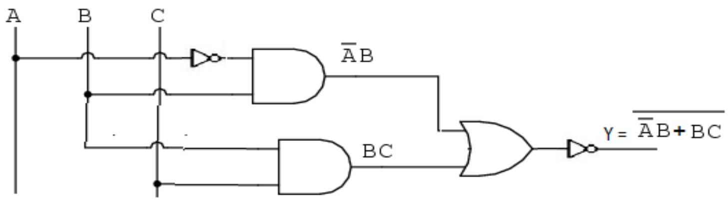
11. Draw the logic circuit for the given Boolean expression, $Y = A\bar{B}C + ABC + \bar{A}B\bar{C}$

Ans:



12. Draw the logic circuit for the given Boolean expression, $Y = \overline{\bar{A}B + BC}$.

Ans:

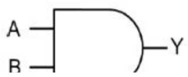


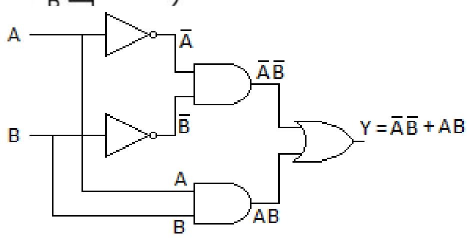
13. Simplify the Boolean expression and draw the logic circuit for the simplified answer.

a) $Y = AB + ABC + AB\bar{C}$

b) Y = $\overline{A\bar{B} + \bar{A}B}$

Ans: a) Y = A.B
b) Y = $\bar{A}\bar{B}$ + AB

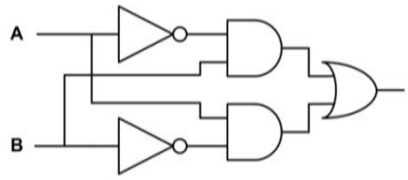




14. Simplify the Boolean expression Y=$\overline{\overline{A\overline{B}+ABC}+A\,(B+A\overline{B})}$.

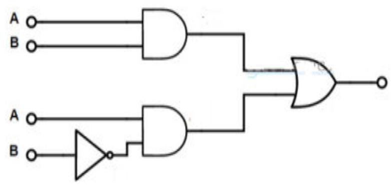
Ans: Y = 0

15. a) Find the Boolean expression for the following logic circuit,



Ans: Y = $A\overline{B}+\overline{A}B$

b) Find the Boolean expression for the given logic circuit.



Ans**:** Y = AB + $A\overline{B}$

Five marks questions (Understanding):

1. State and prove De-Morgans' theorems.
2. Explain transistor NOT gate.
3. Explain two input diode OR gate.
4. Explain two inputs AND gate.
5. Explain two inputs NOR gate.
6. Explain two input NAND gate.
7. Explain the Astable multivibrator using IC 555.
8. Explain the monostable multivibrator using IC-555.

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Chapter-9

Practical Electronic Components, their specifications and PCB

One mark questions (Knowledge):

1. Name any one type of electronics packages available.
2. What is a part number?
3. Name the type of capacitor having polarity.
4. Name the part number of a transistor.
5. Name the part number of a diode.
6. How many pins presents in a diode bridge.
7. Mention one specification of a speaker.
8. Mention a part number of a commonly used temperature sensor.
9. Mention any one case style of transistor.
10. Mention any one part number of a positive fixed voltage regulator.
11. Mention any one part number of a negative fixed voltage regulator.
12. Expand PCB.
13. What is a trace?
14. What is a mask?
15. What is etching?
16. What is PCB layout?
17. What is single side PCB?
18. Name the chemicals used for Etching process in PCB designing.

One mark questions (Understanding):

1. What do you mean by data sheet?
2. For what application fusible resistors are used?
3. Which one is the important specification of a capacitor?
4. Write a part number for a diode.
5. Write a part number of Diode Bridge.
6. What do you mean by 16x2 LCD?

Two marks questions (Knowledge):

1. Mention the important specifications of a resistor.
2. Mention the specifications of a potentiometer.
3. Mention the specifications of a trimmer.
4. Write the any two specification of a transformer.
5. Mention any two types of relays available in the market.
6. Mention any two types of transistors case styles available in market.
7. Write any two specifications of LEDs.
8. Write any one part number for npn and pnp transistors.
9. Mention any two advantages of PCB.
10. Mention two part numbers of IR receiver transistor.

Two marks questions (Understanding):

1. Write a brief note on specification sheet.
2. What do we understand by part number of an electronic component?
3. What information does a package details of a component give?
4. What do you mean by SIP and DIP packages?
5. Write the pin specification for 78XX regulators.
6. Write the pin specification for 79XX regulators.

Three marks questions (Knowledge):

1. List any four advantages of data sheet.
2. Write the steps involved in PCB designing.
3. Write a note on specification of a components and data sheet.
4. List the process involved in the preparation of PCB.

Three marks questions (Understanding):

1. What are the advantages of PCB?
2. Briefly explain the process of preparation of PCB.
3. List 78XX series voltage regulators.
4. List 79XX series voltage regulators.

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BLUE PRINT – 1 for I PUC Electronics Model Question Paper - 1

Total number of hours: 120 Hrs, Total Marks including choice: 105 Marks,
Number of mark per hour: 0.875 mph

SI No.	Name of the Chapter	No. of Hrs	Knowledge 30%				Understanding 40%				Application 30%				Total
			1	2	3	5	1	2	3	5	1	2	3	5	
1	Introduction to Electronics	04	√					√							03
2	Principles of electricity, Network theorems and AC principles	21	√		√			√		√			√	√	19
3	Measuring instruments	04	√					√							03
4	Passive electronic components	22		√	√		√		√	√				√	19
5	Applications of DC and AC to passive components	14		√			√			√				√	13
6	Semiconductors, Diodes and Applications to diodes	26	√		√	√			√	√	√			√	23
7	Bipolar junction transistor	07			√			√			√				06
8	Introduction to digital electronics	18	√		√					√		√		√	16
9	Practical electronic components, their specifications and PCB	04		√			√								03
TOTAL		120	31				42				32				105

Question Paper Pattern

Part-A: 1 Mark questions	-**Ten** (No choice)	1M×10Q → 1M×10Q = 10M
Part-B: 2 Marks Questions	-**Five** out of Eight	2M×8Q → 2M×5Q = 10M
Part-C: 3 Marks Questions	-**Five** out of Eight	3M×8Q → 3M×5Q = 15M
Part-D: (I) 5 Marks Numerical Problems	-**Three** out of Five	5M×5Q → 5M×3Q = 15M
(II) 5 Marks essay type questions	-**Four** out of Six	5M×6Q → 5M×4Q = 20M

Total = 70 marks

MODEL QUESTION PAPER - 1

I PUC ELECTRONICS [40]

Time: 3 Hour15 minute Max Marks: 70

Instructions:

1. The question paper has five parts: A, B, C and D.
2. Part - A is compulsory.
3. Part - D contains two sub parts (I) numerical problems
   (II) essay type questions.
4. Read the instructions given for each part.

PART-A

Answer ALL questions. $10 \times 1 = 10$

1. What is electronics?
2. What is a node?
3. What is sphygmomanometer?
4. What does the power rating of a resistor indicate?
5. What do you mean by capacitive reactance?
6. Write the symbol of Schottkey diode.
7. Determine average DC voltage of HWR. Given $V_m = 9$ V.
8. For a transistor $I_C = 6$ mA and $I_E = 6.35$ mA, find I_B.
9. What is a AND gate?
10. What is etching?

PART-B

Answer any FIVE questions. $5 \times 2 = 10$

11. Silicon is more preferred than germanium in semi conductor devices fabrication, justify.
12. Compare ideal and practical voltage sources.
13. Mention any two advantages of digital thermometer.
14. Draw the pin diagram of LM 35. Mention the application of LM 35.
15. Show the graphical and phasor diagram representation of the phase relation between voltage and current in ac circuit containing only pure inductor.
16. Obtain the relation between α and β.
17. Prove that $A + \overline{A}B = A + B$
18. Write any one part number for npn and pnp transistors.

PART-C

Answer any FIVE questions $5 \times 3 = 15$

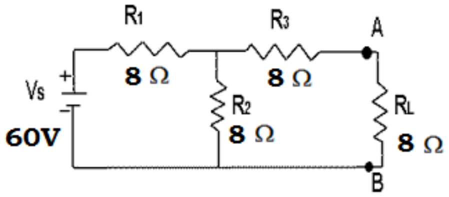
19. Mention any three properties of charges.
20. How do you create 3 V, 2 V and 1 V from a 3 V source?
21. Write a note on pulse transformer.
22. How is a choke constructed? Explain.
23. Write a note on formation of n-type semiconductor.

24. Explain the zener diode as a line regulator.
25. Explain is the doping levels and physical sizes of emitter, base and collector layers.
26. State and prove De-Morgan's Theorems..

PART-D

I Answer any THREE questions. 3 × 5 = 15

27. Using Thevenin's theorem, find the load current and load voltage for the following circuit.



28. A power line feeds input power at 230 V to a step down transformer with its primary windings having 4000 turns. What should be the number of turns in the secondary in order to get output power at 230 V? For an efficiency of 0.7, calculate rms value of primary current when rms value of the secondary current is 5 A.
29. A 10 Ω resistor is connected in series with X_L = 50 Ω and X_C = 25 Ω. The applied voltage is V = 50 mV, 50 Hz. Calculate impedance, Current in the circuit and phase angle.
30. For the Zener diode voltage regulator with V_S = 20 V, R_S = 100 Ω, V_Z = 12 V, R_L = 680 Ω. Determine
    a. Load voltage
    b. Voltage drop across series resistance R_S
    c. Current through the Zener diode
31. Subtract 1111_2 from 11001_2 using 2's complement method. Also verify the same by direct subtraction method.

II Answer any FOUR questions. 4 × 5 = 20

32. Derive an expression for the effective resistance of two resistors connected in parallel.
33. Explain the construction and working of loudspeaker.
34. Derive an expression for impedance in a series RLC circuit
35. Explain the working of positive clamper.
36. Write a note on fixed negative regulator.
37. Explain two input NAND gate.

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BLUE PRINT – 2 for I PUC Electronics Model Question Paper - 2

Total number of hours: 120 Hrs, Total Marks including choice: 105 Marks,
Number of mark per hour: 0.875 mph

SI No.	Name of the Chapter	No. of Hrs	Knowledge 30%				Understanding 40%				Application 30%				Total
			1	2	3	5	1	2	3	5	1	2	3	5	
1	Introduction to Electronics	04	√					√							03
2	Principles of electricity, Network theorems and AC principles	21	√		√			√		√			√	√	19
3	Measuring instruments	04		√			√								03
4	Passive electronic components	22			√	√	√	√	√					√	19
5	Applications of DC and AC to passive components	14	√	√						√				√	13
6	Semiconductors, Diodes and Applications to diodes	26	√		√	√		√	√ √		√			√	23
7	Bipolar junction transistor	07								√	√				06
8	Introduction to digital electronics	18	√		√					√		√		√	16
9	Practical electronic components, their specifications and PCB	04					√	√							03
TOTAL		120	31				42				32				105

Question Paper Pattern

Part-A: 1 Mark questions	-**Ten** (No choice)	1M×10Q → 1M×10Q = 10M
Part-B: 2 Marks Questions	-**Five** out of Eight	2M×8Q → 2M×5Q = 10M
Part-C: 3 Marks Questions	-**Five** out of Eight	3M×8Q → 3M×5Q = 15M
Part-D: (I) 5 Marks Numerical Problems	-**Three** out of Five	5M×5Q → 5M×3Q = 15M
(II) 5 Marks essay type questions	-**Four** out of Six	5M×6Q → 5M×4Q = 20M

Total = 70 marks

MODEL QUESTION PAPER - 2

I PUC   ELECTRONICS [40]

Time: 3 Hour15 minute   Max Marks: 70

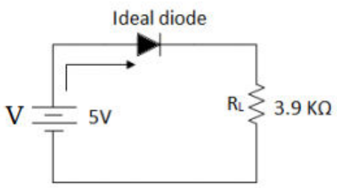
Instructions:

1. 1. The question paper has five parts: A, B, C and D.
2. Part - A is compulsory.
3. Part - D contains two sub parts (I) numerical problems
   (II) essay type questions.
4. Read the instructions given for each part.

PART-A

Answer ALL questions. $10 \times 1 = 10$

1. Who invented JFET?
2. What is the direction of conventional current flow?
3. Which instrument is used to measure the arterial blood pressure?
4. Write the unit for energy stored in an inductor?
5. Define the phase difference between AC quantities.
6. Write diode equation.
7. Calculate the load current for the circuit shown.



8. Find the value of β, if α = 0.99.
9. What is a byte?
10. What do you mean by data sheet?

PART-B

Answer any FIVE questions. $5 \times 2 = 10$

11. Distinguish between microprocessor and microcontroller.
12. Distinguish between open and short circuit.
13. Explain any two controls of oscilloscope.
14. Distinguish between self-inductance and mutual-inductance.
15. Draw the circuit diagram of RC low pass filter. Write the expression for its cut-off frequency.
16. Draw the circuit diagram and waveform for series positive clipper circuit.
17. Multiply $1101_{(2)}$ and $1011_{(2)}$
18. What do you mean by SIP and DIP packages?

PART-C

Answer any FIVE questions $5 \times 3 = 15$

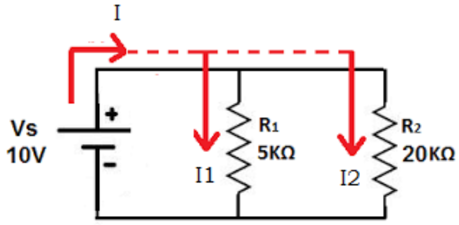
19. Define the terms mesh, branch and loop in an electrical network.

20. A mixer is operated with 230 V of AC supplied with a power rating of 460 W for one minute. Find
    a) The current flowing through it and
    b) Number of electrons flowing in one minute.
21. Write a note on ferrite core inductor.
22. Obtain the expression for effective capacitance of capacitors connected in parallel.
23. Classify solids based on energy band diagram.
24. Explain the working of negative clamper.
25. Explain the working of half wave rectifier.
26. Draw the circuit diagram of astable multivibrator using LM 555. Write the expression for frequency of oscillation and duty cycle.

PART-D

I Answer any THREE questions. $3 \times 5 = 15$

27. Determine the branch currents in the following circuit.



28. Complete the following table for the carbon resistor R.

Sl.no.	I band	II band	III band	IV band	Value of R
1	Orange	Red	Red	Gold	
2					100K ± 10%
3	Brown	Black	orange	Silver	
4					47k ± 20%

29. a) A coil of 100 mH having a resistance of 100 Ω is connected across a source of 200 V, 50 Hz. Find the phase angle and current in the circuit.
    b) A series RLC circuit has R = 20 Ω, C = 0.01 μF, L = 10 mH. Calculate resonant frequency.
30. A 220 V, 50 Hz AC voltage is applied to the primary of 7:1 step down transformer, which is used in bridge rectifier, having a load resistance of 120 Ω. Assuming the diodes to be an ideal, determine the following: (i) DC output current (ii) DC output voltage (iii) DC power delivered to the load and (iv) PIV of each diode.
31. Subtract 27_{10} from 56_{10} using 2's complement method.

II Answer any FOUR questions. $4 \times 5 = 20$

32. State and explain maximum power transfer theorem with an example
33. Write the constructional features of electrolytic capacitor and mention its applications.
34. Discuss the charging of capacitor in a RC circuit.
35. Explain the working of a shunt capacitor filter.
36. Explain how the input and output characteristics of an npn transistor in CE mode are drawn.
37. Explain two inputs AND gate.

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BLUE PRINT – 3 for I PUC Electronics Model Question Paper - 3

Total number of hours: 120 Hrs, Total Marks including choice: 105 Marks,
Number of mark per hour: 0.875 mph

Sl No.	Name of the Chapter	No. of Hrs	Knowledge 30%				Understanding 40%				Application 30%				Total
			1	2	3	5	1	2	3	5	1	2	3	5	
1	Introduction to Electronics	04		√			√								03
2	Principles of electricity, Network theorems and AC principles	21	√		√			√		√			√	√	19
3	Measuring instruments	04		√			√								03
4	Passive electronic components	22	√			√			√	√				√	19
5	Applications of DC and AC to passive components	14		√						√	√			√	13
6	Semiconductors, Diodes and Applications to diodes	26	√	√	√	√	√		√ √					√	23
7	Bipolar junction transistor	07			√		√					√			06
8	Introduction to digital electronics	18						√	√	√	√			√	16
9	Practical electronic components, their specifications and PCB	04	√					√							03
	TOTAL	120	31				42				32				105

Question Paper Pattern

Part-A: 1 Mark questions	-**Ten** (No choice)	1M×10Q	→ 1M×10Q = 10M
Part-B: 2 Marks Questions	-**Five** out of Eight	2M×8Q	→ 2M×5Q = 10M
Part-C: 3 Marks Questions	-**Five** out of Eight	3M×8Q	→ 3M×5Q = 15M
Part-D: (I) 5 Marks Numerical Problems	-**Three** out of Five	5M×5Q	→ 5M×3Q = 15M
(II) 5 Marks essay type questions	-**Four** out of Six	5M×6Q	→ 5M×4Q = 20M

Total = 70 marks

MODEL QUESTION PAPER - 3

I PUC ELECTRONICS [40]

Time: 3 Hour15 minute Max Marks: 70

Instructions:

1. The question paper has five parts: A, B, C and D.
2. Part - A is compulsory.
3. Part - D contains two sub parts (I) numerical problems
   (II) essay type questions.
4. Read the instructions given for each part.

PART-A

Answer ALL questions. 10 × 1 = 10

1. Name any one semiconductor materials used in electronic device fabrication.
2. Define potential difference.
3. How do you connect the voltmeter in a circuit?
4. Define transformer efficiency.
5. Sketch frequency response curve of high-pass filter.
6. Name any one acceptor impurity.
7. Which process emits light from LED?
8. How many pn junctions a transistor has?
9. Perform binary subtraction of the number: 111100_2-1001_2.
10. How many pins are present in a diode bridge?

PART-B

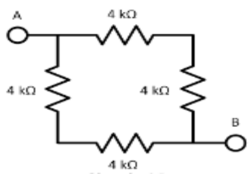
Answer any FIVE questions. 5 × 2 = 10

11. Name any two defence application of electronics.
12. Draw the V-I characteristics of a practical voltage source.
13. Write the symbol of AC ammeter and DC Voltmeter.
14. What is capacitive reactance and give the expression for the capacitive reactance.
15. Mention the typical values of knee voltage for Ge and Si diodes.
16. A transistor has α = 0.9, if I_E = 10 mA, calculate the values of I_C and β.
17. How is a nibble represented? Give an example.
18. Write the pin specification for 79XX regulators.

PART-C

Answer any FIVE questions 5 × 3 = 15

19. Write any three limitations of Ohm's law.
20. Find the total resistance between A and B.

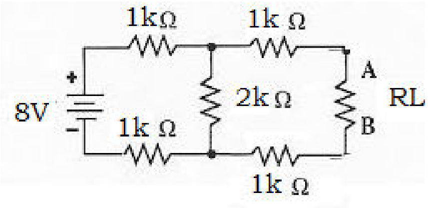


21. Explain the construction of carbon composition resistor.
22. Briefly explain p-type semiconductors.
23. Explain the working of positive clamper.
24. Explain the working of a p-n junction when it is reverse biased.
25. Briefly describe the different regions of output characteristics of transistor in CE mode.
26. Briefly explain the circuit diagram of Monostable Pulse Generator.

PART-D

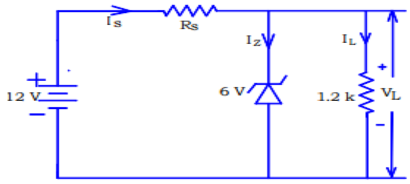
I Answer any THREE questions. $3 \times 5 = 15$

27. Find the value of the load R_L in the below circuit for the maximum power to be transferred and calculate the maximum power transferred to the load.



28. A 2.5 mH inductor is placed in a circuit, where the frequency is 100 kHz and voltage is 50 V. Calculate Inductive reactance and peak current?
29. a) Determine the voltage across the capacitor and maximum current during charging at t = 1 S in a DC circuit containing R = 1 MΩ and C = 1 µF connected to DC supply of 10 V.

    b) A series RL circuit is connected across the ac supply of 150 V, 60 Hz. Find the phase angle if R = 10 Ω and L = 40 mH.
30. a) In the circuit shown in fig. find the value of series resistance R_S, if Zener current is 10 mA.



    b) A silicon diode dissipates 2.5 W for a forward current of 1.5 A. Determine the forward voltage drop across the diode and its bulk resistance.
31. Simplify the Boolean expressions:
    a) $Y = (\overline{A + B})\,(\overline{A}+\overline{C})\,(\overline{B}+C)$
    b) $Y = (A+\overline{B}C)\,(A\overline{B} + C)$

II Answer any FOUR questions. $4 \times 5 = 20$

32. State and explain super position theorem with an example.
33. Derive an expression for the equivalent capacitance of three capacitors connected in series.
34. Explain the construction and working of carbon microphone
35. Describe low pass filter with its frequency response.
36. Explain the construction and working of full wave bridge rectifier.
37. Explain the working of transistor NOT gate.

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