***UNIT - IX***

***SEMICONDUCTOR ELECTRONICS:***

***MATERIALS, DEVICES AND SIMPLE CIRCUITS***

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| Syllabus  Energy bands in conductors, semiconductors and insulators (qualitative ideas only)  Semiconductor diode - V-I characteristics in forward and reverse bias, diode as a rectifier;  Special purpose p-n junction diodes: LED, photodiode, solar cell and Zener diode and their  characteristics, zener diode as a voltage regulator.  Junction transistor, transistor action, characteristics of a transistor and transistor as an  amplifier (common emitter configuration), basic idea of analog and digital signals, Logic gates  (OR, AND, NOT, NAND and NOR). | |
| SEMICONDUCTOR | |
| 01 | Explain the formation of energy bands in solids and hence define valence band and conduction band |
| 02 | Explain the classification of solids on the basis of energy band theory of solids |
| 03 | What are intrinsic semiconductor? What are the properties of semiconductors? Discuss the effect of temperature on semiconductors |
| 04 | What are extrinsic semiconductor? Discuss the formation of (*i*) *n*-type semi conductor (*ii*) *p*-type semi conductor |
| 05 | Distinguish between (*i*) Intrinsic and extrinsic semiconductors (*ii*) *n*-type and *p*-type semiconductors |
| 06 | Draw and explain the energy band diagram of a (*i*) *n*-type semi conductor (*ii*) *p*-type semi conductor |
| 07 | Derive an expression for conductivity of (*i*) *n*-type semi conductor (*ii*) *p*-type semi conductor |
| 08 | Write notes on (*i*) majority and minority carriers in extrinsic semiconductors (*ii*) energy band diagram of extrinsic semiconductor |
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| SEMICONDUCTOR DEVICES  ( *pn* junction diode ) | |
| 01 | What is a *pn* junction? How is depletion layer formed in a *pn* junction? Explain potential barrier in a *pn* junction |
| 02 | What do you mean by biasing of *pn* junction? Discuss the working of a *pn* junction under (*i*) forward biasing (*ii*) reverse bias |
| 03 | How will you draw the V-I characteristics of a junction diode? Discuss the behaviour of the diode from these characteristics |
| 04 | With a neat diagram, explain the working of a full-wave rectifier using junction diodes. Draw a sketch of the input and output waveforms |
| 05 | Discuss the working of a zener diode. How does a zener diode differ from an ordinary junction diode? |
| 06 | Explain the construction and working of a photo-diode. Give five applications of photo-diodes |
| 07 | What is a light emitting diode? Discuss the principle, construction and working of a light emitting diode. |
| 08 | What is a solar cell? Explain the principle, construction and working of a solar cell |
| 09 | What is a zener diode? Explain the working of a zener diode as a voltage regulator. |
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| ( junction transistor ) | |
| 01 | What is a junction transistor? Explain the working of (*i*) *n-p-n* transistor (ii) *p-n-p* transistor |
| 02 | How will you determine experimentally the input and output characteristics of common emitter transistor circuit? Discuss these characteristics. |
| 03 | Explain the working of common emitter transistor amplifier. Discuss the various gains of this circuit |
| 04 | What is an oscillator? Discuss the principle and working of a transistor oscillator |
| 05 | Derive expressions for (*i*) d.c. current gain (*ii*)a.c. current gain (*iii*) voltage gain and (*iv*) power gain of a common emitter transistor amplifier |
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| SIMPLE CIRCUITS ( Digital Electronics ) | |
| 01 | Discuss the conversion of decimal number system into binary number system. Give two examples. |
| 02 | What is an OR gate? How is it realised? Explain |
| 03 | What is an AND gate? Explain how an AND gate is realised. Write the truth table for AND gate and give its logic symbol |
| 04 | What is NOT gate? Explain how a NOT gate is realised. Give its symbol and boolean expression |
| 05 | Give the logic symbol, truth table and boolean expression for (*i*) OR gate (*ii*) AND gate and (*iii*) NOT gate |
| 06 | Explain (*i*) NAND gate (*ii*) NOR gate |
| 07 | How will you obtain OR gate, AND gate and NOT gate by using NAND gate/gates alone? |
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