**Electrical General Training 04 Task 1**

1. **What is the primary usage of transformers, and are they suitable for use with batteries?**
   * Primary Usage:
     + Voltage step-up/down (AC-AC conversion).
     + Isolation between circuits.
     + Impedance matching.
   * Battery Compatibility:
     + Not directly suitable (transformers require AC input).
     + Use with batteries requires an inverter to convert DC to AC first (e.g., in UPS systems).
2. **If you want to protect your circuit from overcurrent, which component is used for this purpose? Mention its different types if applicable.**
   * The fuse is used for overcurrent protection.
   * Types:
     + Fast-acting (electronics).
     + Slow-blow (motors, inrush currents).
     + Resettable (PTC fuses, e.g., polyfuse).
3. **What are the advantages and disadvantages of through-hole components?**
   * Advantages
     + Easy manual soldering/repair
     + Robust mechanical bonds
     + Better for high-power/heat
   * Disadvantages
     + Larger PCB footprint
     + Slower assembly (vs. SMD)
     + Not suitable for high-density designs
4. **What are the advantages and disadvantages of surface-mount devices (SMD)?**
   * Advantages
     + Smaller size/higher density
     + Faster automated assembly
     + Lower parasitic inductance
   * Disadvantages
     + Harder to hand-solder
     + Prone to tombstoning
     + Less robust in high-vibration environments
5. **What factors cause resistors to increase in physical size?**
   * Higher power rating
   * Higher voltage rating
6. **According to the JEDEC standard, what are the dimensions of a component labeled 0805 in imperial units?**
   * Imperial: 0.08" (L) × 0.05" (W) (2.0mm × 1.25mm in metric).
7. **Your circuit requires a 1210 resistor with a sufficient power rating, but the ambient temperature is 80 °C. What is the actual power this package can handle under these conditions?**
   * The resistor 1210 handles a power of 0.5W, and at 80°C, it has 80% of its efficiency; therefore, the actual power is 0.5W \* 80% = 0.4W
8. **Mention three types of capacitors and briefly compare them in terms of applications and polarity.**

| **Type** | **Applications** | **Polarity** |
| --- | --- | --- |
| Electrolytic | Power supply filtering | Polarized |
| Ceramic | Decoupling, high-frequency | Non-polarized |
| Tantalum | Compact high-capacitance | Polarized |

1. **How can you determine the polarity of a through-hole LED?**
   * The long lead is the anode, and the shorter lead with a flat edge on the case is the cathode.
2. **Mention three different components that commonly use the TO-220 package.**
   * Voltage Regulators (e.g., LM7805).
   * Power Transistors (e.g., TIP120 Darlington).
   * Triacs/SCRs (e.g., BT138 for AC switching).