Capacitors

- select appropriate capacitors to suit applications;
- understand the term 'working voltage' of a capacitor;
- describe the physical construction and selection of common types of capacitor;
- i.e. electrolytic, ceramic, polyester and tantalum;
- understand the use of capacitors to decouple an IC and smooth noise created by inductive transducers, i.e. dc motors.

Diodes

- understand the use of a diode as a one way conductor;
- use a diode in an inductive circuit to protect against back emf;
- use LED's in circuits and select a suitable current limiting resistor;
- understand the different characteristics of LED and LCD displays.

Transistors

- identify the base, emitter and collector lead of a bipolar junction transistor from a diagram or data sheet;
- recognise the symbols for NPN and PNP transistors;
- describe how current flow between collector and emitter can be controlled by the difference in voltage between the base and emitter;
- build simple circuits and sketch methods of biasing a transistor, i.e. single resistor, potential divider;
- be aware of the need for heat sinks to regulate temperature in power transistors;
- draw the circuit diagram and describe the use of the 'Darlington Pair' transistor configuration and be aware of transistor arrays, i.e. ULN 2003, ULN 2803;
- describe and explain the use of transistors in switching circuits.

5.3.2 Systems and Control (5a)

Candidates should develop an understanding of control systems, to include:

Integrated Circuits

- explain what is meant by a dual-in-line package and identify pin numbers.

Operational Amplifiers

- Construct and draw circuits showing the use of an OP-AMP as a comparator in a single rail circuit, i.e. using a 3140;
- select suitable values of resistors for OP-AMP circuits;
- construct and draw circuits showing the use of an OP-AMP as a comparator.

Timers

- use an IC to build an astable device for use in counting circuits, i.e. 4011 quad NAND, 555 timer;
- use an IC to provide a monostable circuit i.e. 4528B, 555 timer;
- output the clock pulses to an LED, loudspeaker, transistor or other IC.

Counting

- use the binary counting system to convert to and from decimal number up to 255;
- understand the terms bit and byte;
- use a four bit binary counter to count pulses from a transducer or from an astable signal, (transducer - photo-diode, pulse generator - 555 timer in astable mode and as a monostable);
- display a binary count using four LED's;
- understand the need for switch de-bouncing when pulsing a counter, i.e. RS latch;
- understand the need for rapid switching in a digital circuit, e.g. Schmitt trigger.