

SECTION A

Answer **THREE** questions from this sections.

1. (a) Define the following terms as used in protection of electrical installations:
- (i) overload current;
 - (ii) discrimination;
 - (iii) fusing factor.
- (6 marks)
- (b) (i) With the aid of a circuit diagram, describe the operation of a current operated earth leakage circuit breaker (ELCB).
- (ii) Describe the following terms as used in earthing tests:
- (I) earth electrode resistance;
 - (II) earth-loop impedance.
- (10 marks)
- (c) A final sub-circuit feeding socket outlets is protected by a re-wirable fuse rated at 30 A and its fusing factor is 2.0. The main fuse before CCU is rated at 40 A and it is a HBC fuse whose fusing factor is 1.25.
- (i) determine the fusing currents of the two fuses;
 - (ii) comment on the suitability of this arrangement.
- (4 marks)
2. (a) (i) Distinguish between cable insulation and cable sheathing.
- (ii) State **four** factors that influence the current ratings of a cable.
- (8 marks)
- (b) (i) Define the term final circuit.
- (ii) Describe **three** features of equipment at consumer's intake point.
- (8 marks)
- (c) State:
- (i) **two** advantages of miniature circuit breakers;
 - (ii) **two** disadvantages of re-wirable fuses.
- (4 marks)

3. (a) Using circuit diagrams, distinguish between a D.C two-wire and A.C two-wire distribution system. (6 marks)
- (b) Draw a labelled diagram of a hydro-power generating plant and explain its operation. (10 marks)
- (c) Draw a circuit to control a lighting point at three different positions using two-way and intermediate switches. (4 marks)
4. (a) Explain the functions of the following authorities for power production in Kenya:
- (i) Kenya Power Company;
- (ii) KenGen. (4 marks)
- (b) With the aid of a labelled diagram, explain the operation of an instant water heater. (8 marks)
- (c) (i) State any **four** parts of a photo-voltaic system.
- (ii) State **four** methods of solar energy harvesting. (8 marks)

SECTION B

Answer TWO questions from this section.

5. (a) (i) State **four** areas of application of solar energy.
- (ii) Distinguish between flat plate and parabolic dish solar collectors stating one application of each. (10 marks)
- (b) Explain the functions of the following in a solar wiring system:
- (i) inverter;
- (ii) charge controller. (4 marks)
- (c) (i) Define the term photo-voltaic.
- (ii) State **four** routine maintenance procedures that need to be carried out on a solar charged battery cell. (6 marks)

6. (a) With the aid of a labelled diagram, explain the working principle of a solar cell. (6 marks)
- (b) Explain how the following factors affect the amount of solar radiation received on the earth's surface:
- (i) geographical location;
 - (ii) time of the day. (4 marks)
- (c) Explain **five** factors to consider when choosing a wiring system. (10 marks)
7. (a) (i) State **three** causes of high resistance connections in cable joints and terminations.
- (ii) State **three** methods of joining cables. (6 marks)
- (b) With the aid of a diagram, describe the method of forming a britannia joint. (7 marks)
- (c) (i) State **four** tests that should be performed on a final circuit.
- (ii) State **three** accessories used in lighting circuits. (7 marks)
8. (a) Draw a schematic diagram of a d.c machine and explain the following parts:
- (i) stator;
 - (ii) rotor;
 - (iii) commutator. (11 marks)
- (b) With the aid of schematic equivalent circuit diagrams, describe the following classes of d.c motors:
- (i) shunt motor;
 - (ii) series motor;
 - (iii) compound motor. (9 marks)