

SECTION A

Answer any **THREE** questions from this Section.

1. (a) (i) Define the term 'appliance' as used in electrical installations.
- (ii) State three IEE regulations regarding:
- I ceiling roses in lighting circuits;
- II 13A socket outlets in power circuits. (8 marks)
- (b) With the aid of circuit diagrams, distinguish between 'radial' and 'ring' final circuits for socket outlets. (8 marks)
- (c) Describe how polarity test is conducted with supply switched:
- (i) ON;
- (ii) OFF. (4 marks)
2. (a) Name **three** state authorities which are involved with power production and distribution. (3 marks)
- (b) (i) With the aid of a labelled circuit diagram, draw a three phase 4-wire supply system and show the distribution of both single and three phase loads.
- (ii) State **three** advantages of ac system over dc system. (9 marks)
- (c) With the aid of a labelled block diagram, describe the layout of diesel power generator. (8 marks)
3. (a) State:
- (i) **two** properties of the following conductor materials:
- I copper;
- II aluminium.
- (ii) the difference between a joint and a termination. (8 marks)
- (b) Describe the correct procedure for selecting suitable cable size for a particular installation. (6 marks)
- (c) Draw a labelled diagram of a two-core pvc armoured pvc insulated cable. (6 marks)

4. (a) State **two**:
- (i) advantages of using solar energy over other sources of electricity;
 - (ii) factors to be considered when choosing a wiring system for solar installation. (4 marks)
- (b) Explain the **two** installation resistance tests which are carried out on a completed solar installation. (4 marks)
- (c) (i) Explain the need for:
- I sizing a solar installation system;
 - II servicing and maintaining a solar installation system. (4 marks)
- (ii) Describe the procedure for determining the current size of a solar electric system. (8 marks)

SECTION B

Answer any TWO questions from this Section.

5. (a) Define the following terms as used in protection;
- (i) discrimination;
 - (ii) current rating. (4 marks)
- (b) (i) Distinguish between 'close excess current' protection and 'coarse excess current' protection;
- (ii) Draw a labelled diagram of a HRC fuse. (9 marks)
- (c) Describe with the aid of a labelled circuit diagram the protective multiple earthing system (PME). (7 marks)
6. (a) Describe the following parts of a DC machine:
- (i) commutator;
 - (ii) brushes;
 - (iii) armature. (9 marks)

- (b) Draw a labelled circuit diagrams for the following DC motors:
- (i) separately excited;
 - (ii) shunt motor;
 - (iii) series motor. (6 marks)
- (c) Name the construction parts of a capacitor start-capacitor run induction motor. (5 marks)
7. (a) State **two**:
- (i) advantages of MCB's over fuses;
 - (ii) types of ELCB's. (4 marks)
- (b) Describe with the aid of a labelled diagram the operation of a non-instantaneous type water heater. (8 marks)
- (c) Illustrate the connection of lighting circuits terminated at the following:
- (i) joint box;
 - (ii) three phase ceiling rose. (8 marks)
8. (a) Determine the following terms in relation to solar energy:
- (i) insolation;
 - (ii) radiation. (4 marks)
- (b) With the aid of diagrams, show how solar energy is harvested using the following methods:
- (i) parabolic dish;
 - (ii) parabolic trough. (6 marks)
- (c) (i) State any **four** disadvantages of concentrating type solar cookers.
- (ii) With the aid of a labelled diagram, describe the construction of a box cooker. (10 marks)