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 insolated 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)