Section A -Answer ALL questions. All questions carry equal marks.

1. State
   a) TWO circumstances under which an Electrical Installation Certificate would be required
   b). the documentation that must accompany such a certificate.

2. State THREE non-statutory documents, in common use, that are relevant to the inspection and testing of an installation.

3. BS 7671 requires that an inspector has available charts, diagrams or similar information, relating to the installation. State THREE items that should be included on such information.
   (Do not include details of the incoming supply)

4. State the form of protection against electric shock provided by EACH of the following
   a). Class II equipment
   b) Placing out of reach
   c) EEBADS.

5. State the documents that must be completed for EACH of the following
   a) the addition of a socket outlet to a ring final circuit
   c) the inspection and testing of a domestic installation which is ten years old
   c) a shower circuit added to an existing installation.

6. State who should be signatories to an Electrical Installation Certificate.

7. State
   a) the legal status of those who authenticate installation certificates
   b) TWO human senses used during the inspection and testing process.

8. State the.
   a) colour Identification for the 'strappers' on a two-way lighting circuit wired with three-core and c.p.c. p.v.c./p.v.c. cable
   b) wording required on a label at the connection of a main equipotential bonding conductor to a water service.
   c) IP rating of an accessible horizontal top surface of an enclosure.

9. For a construction site, State the
   a) electrical supply to be used for portable hand held tools
   c) maximum disconnection time for the system in a) above
   c) meaning of 25 in the formula Zs. In< 25,

10. The end to end resistance of two separate 2.5 sq mm protective conductors were measured (at 20°C) as 0.0371 ohms and 0.1631 ohms. Determine, showing all calculations, the

a) length of EACH conductor (2.5 sq mm *is* 7.41 mohms/m at 20°C)
b) overall resistance of two conductors wired in parallel and each measuring 0.071 ohms.

11. When testing the continuity of protective conductors, State the ,
a) instrument to be used
b) precautions to be taken (according to GN3) if the test is part of a periodic inspection and testing process.

12. Give THREE examples of a ferrous material or enclosure that may be used as a protective conductor. .

13. Identify the protective conductor that connects together EACH of the following
a) a buried earth electrode and the main earthing terminal
b) exposed and extraneous conductive parts in zones A, B and C in a swimming pool
c) Structural Steelwork and the main earthing terminal.

14 State the THREE MAIN technical reasons for conducting a ring final circuit continuity test.

15 For an insulation resistance test on a domestic installation, State the
a) instrument to be used -
b) resistance range on which this instrument should be set
c) measured value, below which each circuit would need to be tested separately.

16. A live polarity test is to be conducted, State
a) why such a test is necessary
b) the instrument to be used
c) how neutral-earth polarity is checked.

17. An earth fault loop impedance test is to be conducted on a radial circuit during an initial verification. State .
a) where on the circuit the test should be conducted
b) which value, measured or corrected, should be recorded on a schedule of test results
c). why the value in b) may not be the same as Ze + (R1 + R2.)

18 The measured values of earth fault loop impedance for three circuits are 1.1 ohms, 2.4 ohms and 3.3 ohms. If the maximum permissible values for these circuits are 1.5 ohms, 3.45 ohms and 4.0 ohms, determine, (showing all calculations and using the 'rule of thumb method') if the measured values are acceptable.

19. With reference to r.c.d.'s, state
    a) ONE application for a 500 mA device
    b). the minium rating of a device when used for supplementary protection against direct contact
    c) maximum test current to be applied to a 10 mA device.

20. State the
    a) type of earthing system that would enable PSCC to be calculated from values of UOC and Ze
    b) meaning of Ze
    c) accepted value of UOC

21 State for this installation

a) the type's of verification that would need to be undertaken
b) the status of the person carrying out the verification
c) the legislation that would apply
d) the documentation that would need completing
d) THREE items from the BS7671 or GN3 check list that would need to be considered.

22. a) List SIX departures from BS 7671 that should be revealed during the inspection process.
b) State where should such departures be-recorded.

23. List the

a) Relevant instrument tests in the correct sequence to be carried out on this new installation. (Only tests relevant to this installation will be accepted)
b) instruments to be used for EACH of the tests in a) above.

24 Describe, in detail, how an insulation resistance test on the new lighting circuit would be carried out.

25. If, before any remedial work is undertaken, the measured values of
(R1 + R2) for the ring circuit is 0.35 ohms
Ze at the intake is 0.09 ohms
(R1 + R2) for the new circuit is 0.4 ohms.

a) Determine a value for Zs for the lamp post circuit.
b) State TWO conditions that could influence this value.
b) Explain the simplified method used, if factors for the conditions in b) are not known.
c) State whether the value in a) is acceptable if the 30 A BS 3036 ring circuit fuse has a maximum ZS value of 1.14 ohms. (Show all calculations).

26 The consumer energised this installation before inspection and testing and a fault developed between a phase conductor and the casing of one of the posts.

a) State
i) what risk this situation poses
ii) why the BS 3036 fuse may not operate.

b) Draw a labelled diagram of the earth fault path for the lamp post circuit.

Section B -Answer ALL SIX questions. All questions carry equal marks.

A consumer has acquired four antique cast-iron lamp posts and has converted them to accommodate Edison screw tungsten filament lamps and installed them at various points in the garden. A PIR controlled tungsten halogen security light has also been installed on the side of the house. The posts and the security light have been supplied from a standard metal clad, one-gang, one-way grid switch externally mounted. The feeds to all the lights are in 1.0 sq.mm p.v.c./p.v.c. twin with c.p.c. cable, clipped direct to the external brickwork and also laid in 25 mm of sand under the patio slabs to each post in the form of a radial circuit. The metal clad switch is fed from. a socket outlet on the downstairs ring final circuit using 1.5 sq mm p.v.c./p.v.c. twin with c.p.c. cable which passes through the wall and is clipped with the 1.0 sq mm cable on their edges up to the switch.
Each Edison screw lamp fitting together with a terminal block is mounted on a plastic base and secured in the head of each pot. An inspection and test of this installation is to be carried out.

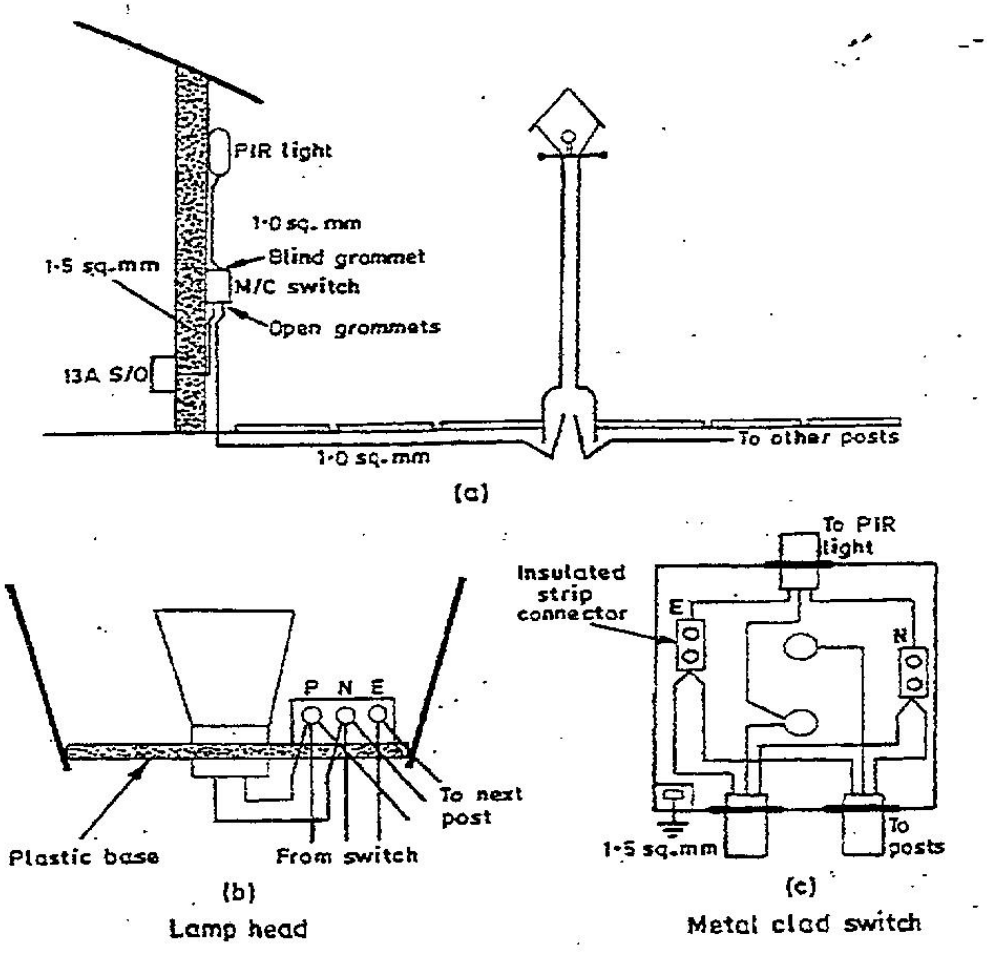

FIG. 1