Section A. Answer ALL TWENTY questions. ALL questions carry equal marks.

1 State the general documentation and information that is required by a person prior to carryng out an intitial verification of a new installation.

2 Select from the following list the THREE documents relevant to the fixed electrical installation in a factory.
-BS 7671.
-The IEE Guidance Notes.
-The Code of Practice for In-Service Testing of Electrical Equipment.
-The Electricity at Work Regulations 1989.

3 State
a) the meaning of i) EEBADS
ii) indirect contact
b) one other method of protection against indirect contact.

4 One of the items to be checked during an initial inspection is the presence of diagrams. charts and similar information. State THREE items of information that should be included on such diagrams, charts etc.

5 State the
a) legislation with which a person carrying out an inspection and test of an installation must comply
b) status of such a person
c) MAIN requirement regarding the use of the installation whilst inspection and testing is in progress.

6 State the preferred method of using an approved test lamp to check that a circuit is dead and safe to work on. in accordance with the recommendations of GS38. .

7 State the test voltages to be applied during an insulation resisunce test on EACH of the following circuits.
a) A 25 V circuit supplied from a BS 3535 isolating transformer.
b) A 230V industrial cooker circut.
c) a 700 V discharge lighting circuit.

8 State why the test for continuity of protective conductors must be conducted before the test for
a) insulation resistance
b) polarity
c) loop impedance.

9 Identify the protective conductors that connect together
a) an immersion heater and the main earthing ternlinal .
b) the main earthing ternlinal and the means of earthing
c) Structural steelwork and the main earthing terminal.

10 A c.p.c. continuity test is to be carried out on a radial socket outlet circuit comprising four outlets. State
a) the instrument to be used
b) at which socket outlets the test should be performed
c) the significance of the instrument reading at the last socket outlet.

11 A ring final circuit continuity test revealed incorrect polarity on three socket outlets. The results were

	P to N	P to c.p.c.
Socket A	open circuit	correct
Socket B	correct	open circuit
Socket C	open circuit	open circuit

State which conductors have reversed polarity in EACH case.

12 a) The resistance ofa 50 m length of conductor is 0.1 ohms. What would be the resistance of 100 m of the same conductor?
b) The insulation resistance of 1000 m of twin cable is 50M-ohms .What would be the insulation resisunce of 2000 m of the same conductor?
c) The resistance of a length of 1.0 mm^2 conductor is 0.2 ohms. What would be the resistance of a 4.0 mm^2 conductor of the same length?

13 Explain briefl1y the action to be taken if the insulation resistance test of an installation indicates an overall value of 1.25 M-ohms.

14 State
a) the two IP codes relating to penetration tests on enclosures that have had insulation applied on site
b) which other test must be performed on the enclosures in a).

15 The IP codes comprise of two or three numerals. State the
a) significance of the first and second numeral for a two numeral code
b) protection provided by IP4X.

16 The IEE Guidance Note 3 requires that polarity is checked before and after the supply is energised. State
a) why the live polarity test is needed
b) at what part of the installation the test would norma.lly be made
c) ONE method of carrying out the test.

17 State the earth return path for EACH of the following
a) TT
b) TN-S
c) TN-C-S.

18 State THREE possible methods of overcoming the problem of a high measured value of earth fault loop impedance (Z_s).

19 An external earth fault loop impedance (Ze) test is to be performed on a TT system protected by an r.c.d. State the
a) test instrument to be used
b) points at which the instrument should be connected
c) action to be taken regarding the earthing conductor.

20 A test is to be made on a 30 mA r.c.d. using an r.c.d. tester. State the tripping requirements of the r.c.d. when EACH of the following currents is applied
a) 15 mA
b) 30mA
c) 150 mA

A small, light industrial factory engaged in dry powder coating of metal components is to have a periodic inspection and test for insurance purposes.

The Wiring system is formed by steel trunking and conduit with associated single core p. v.c. insulated copper conductors (phase, neutral and c.p.c.). All protective devices are BS 88 part II fuses.
The powder coating process involves immersion of the metal items in an acid bath to remove grease etc, coating them with a spray of dry powder (Electrostatic), and then running them through a gas-fired tunnel oven on an overhead continuous conveyor system.

The lighting in the main factory area is provided by high bay SON lamps, on a plug and socket system.
The office accommodation comprises a main office area and male and female toilets. The wiring system for this area is p.v.c./p.v.c. twin and c.p.c., the socket outlets being fed in the form of a ring final circuit. ,
The earthing system is T.N-C-S.

21 State, the documentation that

a) i) would be useful to have available before commencing the inspection and testing process
ii) will need to be completed. (5 marks)

State the

b) TWO statutory Regulations that apply to the periodic inspection and testing procedure (6 marks)

c) action to be taken if no documentation regarding the installation was available. (4marks)

22 The installation as been in existence for fifteen years. list FIVE particular areas of inspection, apart from general wear and tear, that should be considered. (15 marks)

23 The method of protection against indirect contact for this installation is by EEBADS .
List in sequence, the tests that would need to be carried out. (15 marks)

24 Describe how a ring final circuit continuity test would be carried out for the office area. Indicate which result would be recorded on a test schedule. (15 marks)

25 Draw a labelled diagram of the earth fault loop path associated with any ONE of the circuits in this installation. (15 marks)

26 An earth fault loop impedance test on a 50 A compressor circuit gives a result of 0.93 ohms.
The result of a previous c.p.c. continuity test for this circuit gives ($R_1 + R_2$) as 0.47 ohms.
The ambient temperature at the time of the test was 25°C (factor 0.98) and the cable is 70°C p. v.c. (factor 1.2).
If the maximum tabulated value of Zs for this circuit is 1.09 ohms, show by calculation (not the rule of thumb method) if the measured value of Zs is acceptable. (15 marks)