

**WRITE ALL YOUR WORK IN THE ANSWER BOOK PROVIDED.
EVERY ANSWER SHOULD INCLUDE ALL WORKINGS, NECESSARY
DIAGRAMS AND FORMULAE.**

START EACH ANSWER ON A FRESH PAGE.

1. During the course of wiring a flat, an electrician falls from a ladder and appears to be unconscious. List the immediate and subsequent actions to be taken by:
- The person who finds him. **(10 marks)**
 - The person in charge. **(10 marks)**
- 2a. Describe using a diagram the local system of Earthing (TT System). **(8 marks)**
- b. Using diagrams describe briefly four types of earth electrodes. **(8 marks)**
- c. The IEE Regulations require that an extraneous metalwork close to an electrical installation is bonded. Draw a clear and well-labelled diagram of a suitable clamp and label which can be used to bond a metal water-pipe. **(4 marks)**
- 3a. Explain the term Diversity factor and Maximum demand. **(3marks)**
- b. A domestic house installation supplied from a 230Volt, 50Hz, single phase consists of the following items:-

Item	Quantity	Rating of EACH item
General lighting Lamps	20	100W
Air-conditioner	2	2kW
Garage door	1	0.75kW
Appliances	5	0.25kW
Water heater	2	1.2kW
Washing machine	1	2kW

Calculate:-

- The maximum demand without using diversity factor; **(4marks)**
 - The maximum demand when using a reasonable diversity Factor to limit the main circuit -breaker (type C to BS EN 60898) current rating of 40Amps. **(8marks)**
- c. What is the current rating of the distribution board. **(2marks)**
- d. Explain what happens when all the items in the table above are switched-on at the same time? (one is expected to give three outcomes) **(3marks)**

- 4a. Define the following terms and give one application for each:
- Conduit **(4 marks)**
 - Cable trunking **(4 marks)**
- b. An electric oven complete with four electric hobs has a total rated power of 6kW, 230V 50Hz. This is to be supplied directly from the Consumer Unit with PVC single core cables drawn into a PVC conduit. The conduit route length between the Consumer Unit and the Cooker Unit is measured as 10m. The ambient temperature is expected to reach 40°C. Ignoring any diversity, calculate:
- The load current **(3 marks)**
 - The MCB rating **(1 mark)**
 - The correct cable size **(4 marks)**
 - The conduit size if it has two bends **(4 marks)**

Refer to Tables 4.1 to 4.6

- 5a. What do you understand by stroboscopic effect in conjunction with discharge lamps? **(5marks)**
- b. Draw the construction and application of a sodium low or high lamp. Mention the advantage and disadvantage. **(5marks)**
- c. What is the maximum mass permissible in the I.E.E. regulations? If the mass of the luminaire exceeds the specified value, give a description how you will install this SON luminaire. **(5 marks)**
- d. The connection of a filament lamp to the fixed wiring installation is by a ceiling rose to B.S.67, State:-
- The ceiling rose requirements; **(3marks)**
 - The maximum rating of the overcurrent protection device; **(1 mark)**
 - If the filament lamp holder is E40, where do you connect the live conductor? **(1 mark)**

6. The phase terminal inside a 1.5kW electric toaster develops an earth fault to the metal frame of the toaster. The earth fault resistance when measured at the toaster plug is found to be 5ohms. The appliance is supplied from a 230V a.c. supply and the only protection is by a 10Amp fuse. The earth loop impedance at the socket where this appliance is connected is measured as 15 ohms.
- a. Draw an equivalent circuit diagram for this fault and show clearly the current paths under fault conditions. (5 marks)
- b. Calculate the fault current (4 marks)
- c. Calculate the voltage on the metal frame if the earth resistance is 10ohms (4 marks)
- d. From your calculations say if the toaster protection operates at this fault conditions and if it is safe to use the appliance (4 marks)
- e. If it is not practically possible to lower the earth circuit resistance what additional protection is required? (3 marks)

END OF PAPER

**EXAMINATION FOR THE ISSUE OF A LICENCE TO
ACT AS WIREMAN - LIC 'A'**

June 2012

Paper II (Electrical Installation Technology)

Time Allowed - 3Hrs