

1. (a) (i) Define the term power factor.
 - (ii) State any **three**:
 - I. Methods of improving power factor;
 - II. Advantages of high power factor. (8 marks)
 - (b) (i) Explain the term diversity factor as applied to tariffs.
 - (ii) A 50kw , 415V, 3-phase motor operates on full load, at 0.75 power factor lagging with an efficiency of 85%;
 - I. Determine the KVA demand and current taken from the supply;
 - II. If the power factor is improved to 0.95, calculate the reduction in KVA demand and current taken from the supply. (12 marks)
2. (a) Outline **four** advantages of the grid system. (4 marks)
 - (b) Draw a labelled single line diagram of a typical transmission system in Kenya, showing standard voltages at every stage. (6 marks)
 - (c) Explain the following:-
 - (i) any **three** classification of voltage for consumer's circuits;
 - (ii) the advantages of ring main distribution system;
 - (iii) advantages of A.C. system over D.C. system; (10 marks)
 3. (a) State any **five** types of motor enclosures. (5 marks)
 - (b) Explain any **four** factors that may be considered when selecting a motor for a particular drive. (4 marks)
 - (c) Draw a circuit diagram for an automatic Star-Delta starter for a three phase induction motor. (11 marks)
 4. (a) State any **three**:
 - (i) I.E.E. Regulation requirements regarding corrosion in cables;
 - (ii) Precautions for preventing the occurrence of corrosion. (6 marks)
 - (b) Explain how static electricity is produced in operating theatres and state how it may be eliminated. (6 marks)

- (c) With aid of a diagram, describe the sacrificial anode of cathodic protection. (8 marks)
5. (a) State any:-
- (i) **three** methods of tendering;
 - (ii) **four** circumstances that may lead to discharge of a contract. (7 marks)
- (b) Outline the procedure of taking-off materials from architectural drawings. (7 marks)
- (c) Explain the functions of the following estimating process:
- (i) primary;
 - (ii) secondary. (6 marks)
6. (a) State the disadvantages of connecting luminaires in series when illuminating working areas. (3 marks)
- (b) Explain:-
- (i) how a fluorescent luminaire may be operated on direct current supply.
 - (ii) the purpose of a ceiling rose in an installation;
 - (iii) the failure of mercury vapour luminaires to re-start immediately. (12 marks)
- (c) Explain how the installation of discharge luminaires may produce poor power factor in the installation. (5 marks)
7. (a) State:-
- (i) the main objective of cable segregation;
 - (ii) the categories under which cables may be segregated and their areas of application. (7 marks)
- (b) Describe the following wiring systems:
- (i) skirting trunking;
 - (ii) lighting trunking. (10 marks)
- (c) Explain how the effects of high ambient temperatures are compensated for when installing a non-metallic trunking system. (3 marks)

8. (a) i. Define the following terms:-
- (I) fuse;
 - (II) isolator. **(4 marks)**
- ii. State the difference between “current rating” and minimum fusing current of a fuse. **(2 marks)**
- (b) Explain the term ‘Discrimination’ as used in protection against excess currents. **(4 marks)**
- (c) With the aid of a circuit diagram, explain the operation of a current operated earth leakage circuit breaker. **(10 marks)**